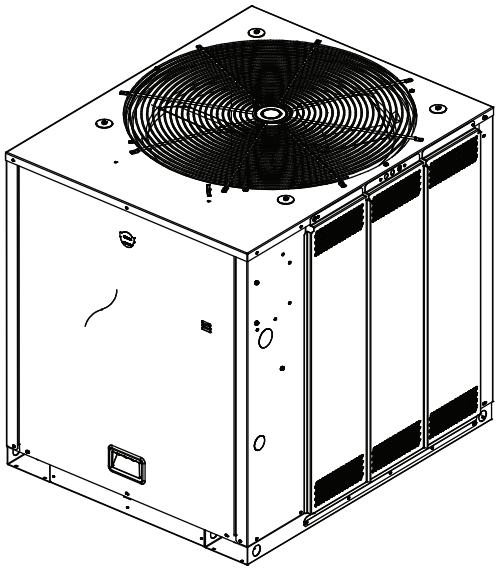
Installation, Operation, and Maintenance

Split System Air Conditioners
Odyssey™

R-22 Dry Charge
Heat Pump Condenser — 7.5, 10, 15 and 20 Tons

(60 Hz)
TWA090A***G*
TWA120A***G*
TWA180B***G*
TWA240B***G*



⚠ SAFETY WARNING

Only qualified personnel should install and service the equipment. The installation, starting up, and servicing of heating, ventilating, and air-conditioning equipment can be hazardous and requires specific knowledge and training. Improperly installed, adjusted or altered equipment by an unqualified person could result in death or serious injury. When working on the equipment, observe all precautions in the literature and on the tags, stickers, and labels that are attached to the equipment.

January 2014

SSP-SVX15C-EN

Ingersoll Rand

Introduction

Read this manual thoroughly before operating or servicing this unit.

Warnings, Cautions, and Notices

Safety advisories appear throughout this manual as required. Your personal safety and the proper operation of this machine depend upon the strict observance of these precautions.

The three types of advisories are defined as follows:

⚠WARNING	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury. It could also be used to alert against unsafe practices.
NOTICE	Indicates a situation that could result in equipment or property-damage only accidents.

Important Environmental Concerns

Scientific research has shown that certain man-made chemicals can affect the earth's naturally occurring stratospheric ozone layer when released to the atmosphere. In particular, several of the identified chemicals that may affect the ozone layer are refrigerants that contain Chlorine, Fluorine and Carbon (CFCs) and those containing Hydrogen, Chlorine, Fluorine and Carbon (HCFCs). Not all refrigerants containing these compounds have the same potential impact to the environment. Trane advocates the responsible handling of all refrigerants-including industry replacements for CFCs such as HCFCs and HFCs.

Important Responsible Refrigerant Practices

Trane believes that responsible refrigerant practices are important to the environment, our customers, and the air conditioning industry. All technicians who handle refrigerants must be certified. The Federal Clean Air Act (Section 608) sets forth the requirements for handling, reclaiming, recovering and recycling of certain refrigerants and the equipment that is used in these service procedures. In addition, some states or municipalities may have additional requirements that must also be adhered to for responsible management of refrigerants. Know the applicable laws and follow them.

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.
All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state electrical codes.

⚠ WARNING

Personal Protective Equipment (PPE) Required!

Failure to wear proper PPE for the job being undertaken could result in death or serious injury. Technicians, in order to protect themselves from potential electrical, mechanical, and chemical hazards, MUST follow precautions in this manual and on the tags, stickers, and labels, as well as the instructions below:

- **Before installing/servicing this unit, technicians MUST put on all Personal Protective Equipment (PPE) recommended for the work being undertaken. ALWAYS refer to appropriate MSDS sheets and OSHA guidelines for proper PPE.**
- **When working with or around hazardous chemicals, ALWAYS refer to the appropriate MSDS sheets and OSHA guidelines for information on allowable personal exposure levels, proper respiratory protection and handling recommendations.**
- **If there is a risk of arc or flash, technicians MUST put on all Personal Protective Equipment (PPE) in accordance with NFPA 70E or other country-specific requirements for arc flash protection, PRIOR to servicing the unit.**

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⚠ WARNING

Refrigerant under High Pressure!

Failure to follow instructions below could result in an explosion which could result in death or serious injury or equipment damage.

System contains oil and refrigerant under high pressure. Recover refrigerant to relieve pressure before opening the system. See unit nameplate for refrigerant type. Do not use non-approved refrigerants, refrigerant substitutes, or refrigerant additives.

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Revision History

Removed warranty chapter, updated with running edits.

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Model Number Description

Heat Pump Condenser

TWA	**120**	**A**	**3**	**00**	*	*
123	**456**	**7**	**8**	**910**	**11**	**12**

All products are identified by a multiple-character model number that precisely identifies a particular type of unit. An explanation of the alphanumeric identification code is provided. Its use will enable the owner/operator, installing contractors, and service engineers to define the operation, specific components, and other options for any specific unit. When ordering replacement parts or requesting service, be sure to refer to the specific model number, serial number, and DL number (if applicable) stamped on the unit nameplate.

DIGITS 1 - 3: Product Type

TWA = Split System Heat Pump

DIGITS 4 - 6: Nominal Gross Cooling Capacity (MBh)

090 = 7.5 Tons (60Hz)
120 = 10 Tons (60Hz)
180 = 15 Tons (60Hz)
240 = 20 Tons (60Hz)

DIGIT 7: Major Development Sequence

A = Single Compressor, Single Circuit, R-22
B = Dual Compressor, Dual Circuit, R-22

DIGIT 8: Electrical Characteristics

3 = 208–230/60/3
4 = 460/60/3

DIGITS 9 - 10: Factory Installed Options

00 = Packed Stock

DIGITS 11: Minor Design Sequence

* = Current Design Sequence[1]

DIGITS 12: Service Digit

* = Current Design Sequence[1]

1. * = *sequential alpha character*

General Information

This manual describes proper installation, operation, and maintenance procedures for air-cooled systems. By carefully reviewing the information within this manual and following the instructions, the risk of improper operation and/or component damage will be minimized. It is important that periodic maintenance be performed to help assure trouble free operation. Should equipment failure occur, contact a qualified service organization with qualified, experienced HVAC technicians to properly diagnose and repair this equipment.

Important: *All phases of this installation must comply with the NATIONAL, STATE & LOCAL CODES. In addition to local codes, the installation must conform with National Electric Code -ANSI/NFPA NO. 70 LATEST REVISION.*

Any individual installing, maintaining, or servicing this equipment must be properly trained, licensed and qualified.

Important: *Do not remove the VFD without first contacting technical support! For performance-related questions and diagnostic support in North America call 1-877-872-6363. Any return requires a claim number FIRST. Removal of the VFD prior to this step will void the unit's warranties.*

Installation procedures should be performed in the sequence that they appear in this manual. Do not destroy or remove the manual from the unit. The manual should remain weather-protected with the unit until all installation procedures are complete.

Note: *It is not the intention of this manual to cover all possible variations in systems that may occur or to provide comprehensive information concerning every possible contingency that may be encountered during an installation. If additional information is required or if specific problems arise that are not fully discussed in this manual, contact your local sales office.*

Use the "Installation Checklist," p. 26 provided In this manual to verify that all necessary installation procedures have been completed. Do not use the checklist as a substitute for reading the information contained in the manual. Read the entire manual before beginning installation procedures.

Unit Description

These condensers come with single and dual compressor options. Single compressor outdoor units feature a single refrigeration circuitry, requiring only one set of refrigerant lines. Dual compressor/dual circuit models give true stand-by protection; if one compressor fails, the second will automatically start-up. Also, the first compressor can be serviced without shutting down the unit since the refrigerant circuits are independent. During light load conditions, only one compressor will operate to save energy.

Pre-Installation

Unit Inspection

Inspect material carefully for any shipping damage. If damaged, it must be reported to, and claims made against the transportation company. Compare the information that appears on the unit nameplate with ordering and submittal data to ensure the proper unit was shipped. Available power supply must be compatible with electrical characteristics specified on component nameplates. Replace damaged parts with authorized parts only.

Inspection Checklist

To protect against loss due to damage incurred in transit, complete the following checklist upon receipt of the unit.

- ☐ Inspect individual pieces of the shipment before accepting the unit. Check for obvious damage to the unit or packing material.
- ☐ Inspect the unit for concealed damage before it is stored and as soon as possible after delivery. Concealed damage must be reported within 15 days. If concealed damage is discovered, stop unpacking the shipment. Do not remove damaged material from the receiving location. Take photos of the damage if possible. The owner must provide reasonable evidence that the damage did not occur after delivery.
- ☐ Notify the carrier's terminal of damage immediately by phone and by mail. Request an immediate joint inspection of the damage by the carrier and the consignee.
- ☐ Notify the sales representative and arrange for repair. Do not repair the unit until the damage is inspected by the carrier's representative.

Testing for Leaks

All units are shipped with a holding charge of nitrogen in each circuit and should be leak tested before installation.

1. Remove the access panel.
2. Locate the liquid line or suction line access valve for each circuit.
3. Install gauges to determine if the circuits are still pressurized. If not, the charge has escaped and should be repaired as required to obtain a leak-free circuit.

Lifting Recommendations

⚠ WARNING

Improper Unit Lift!

Failure to properly lift unit could result in unit dropping and possibly crushing operator/ technician which could result in death or serious injury, and equipment or property-only damage. Test lift unit approximately 24 inches to verify proper center of gravity lift point. To avoid dropping of unit, reposition lifting point if unit is not level.

NOTICE

Equipment Damage!

Use spreader bars to prevent straps from damaging the unit. Install the bars between lifting straps, both underneath the unit and above the unit to prevent the straps from crushing the unit cabinet or damaging the finish.

Before preparing the unit for lifting, estimate the approximate center of gravity for lifting safety. Because of placement of internal components, the unit weight may be unevenly distributed. See "Weights", p. 14 for approximate unit weights.

The crated unit can be moved using a forklift of suitable capacity. For lifting the unit, attach lifting straps or slings securely to the lifting holes at each corner (see unit drawings in "Weights", p. 14). Use spreader bars to protect the unit casing from damage. Test lift the unit to determine proper balance and stability.

Clearances

Provide enough space around the unit to allow unrestricted access to all service points. Refer to the "Dimensional Data," p. 10 for unit dimensions and minimum required service and free air clearances. Observe the following points to ensure proper unit operation.

1. Do not install the unit under a low overhang. Condenser discharge must not be restricted—refer to notes in "Dimensional Data drawings," p. 10.

   Important: *Do not obstruct condenser discharge air. This can result in warm air recirculation through the coil.*

2. Do not locate the unit in a position where runoff water can fall into the fan discharge openings.
3. Condenser intake air is supplied from three or four sides of the unit. Adhere to the minimum required clearances given in unit dimensional drawings (see "Dimensional Data," p. 10).

Unit Mounting

⚠ WARNING

Mounting Integrity!

Failure to follow instruction below could result in death or serious injury or possible equipment or property-only damage.

Ensure the roof structure supports are strong enough to support the weight of the unit and any accessories.

Structural Preparation

NOTICE

Roof Damage!

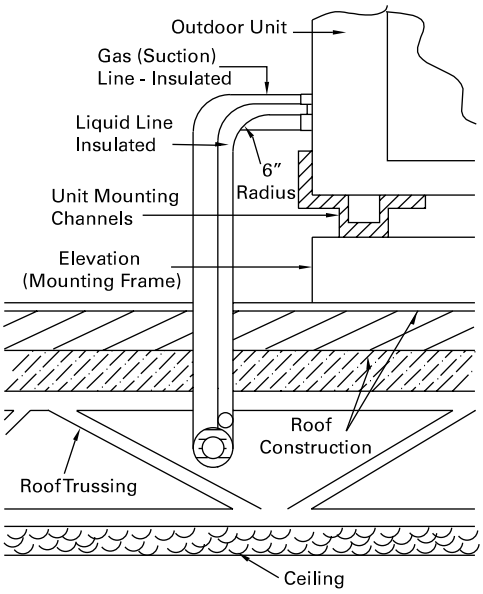
System contains oil and refrigerant under high pressure. Roofs should be protected from exposure to oils and refrigerant in the system. If rooftop is not protected, damage to the roof may occur.

Important: *Refer to local building codes for proper installation. All installation must comply with local building codes.*

Rooftop Mounting

If the unit will be roof mounted, determine for certain that the structure is strong enough to support the unit and any required accessories, see "Weights", p. 14. The unit should be elevated on a level, field fabricated four-inch steel or wood 4" x 4" mounting frame. Complete the frame and secure it into position before lifting the unit to the roof. The mounting frame must support a minimum of three of the unit's four sides and should span roof supports to distribute the load on the roof.

Figure 1. Roof mounted unit



Ground Level Mounting

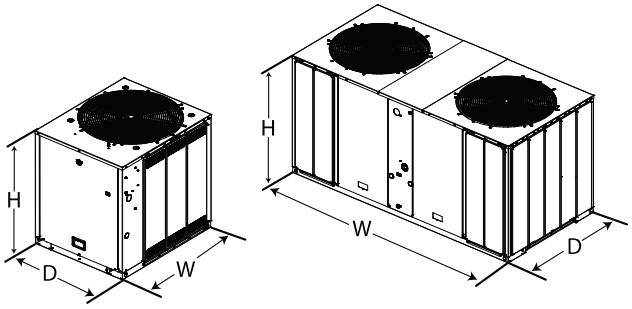
For ground level installation, the unit base should be adequately supported and hold the unit near level. The installation must meet the guidelines set forth in local codes. The support should extend two inches beyond the unit base channels at all points. The unit and support must be isolated from any adjacent structure to prevent possible noise or vibration problems. Any ground level location must comply with required clearances given in the unit dimensional drawings (see "Dimensional Data," p. 10).

Snow Belt Recommendations

In regions where deep snow is encountered, raise the unit a minimum distance of 8 to 12 inches above the mounting surface. This will reduce the risk of snow blocking the coil and improves runoff of water produced during the defrost cycle. Avoid locating the unit where snow tends to drift. Snow accumulations must be removed from around the unit immediately to prevent drastic efficiency reduction. A snow drift barrier may be constructed around the unit to prevent snow blockage. Clearance between the snow barrier and the unit must comply with the clearances given in "Dimensional Data drawings," p. 10.

Dimensional Data

Figure 2. Height, width and depth measurements



	H - in. (mm)	W - in. (mm)	D - in. (mm)
TWA090A	39.125 (993.8)	42.125 (1070)	36 (914.4)
TWA120A	39.125 (993.8)	52.125 (1324)	40 (1016)
TWA180B, TWA240B	45.125 (1146.1)	52.125 (1324)	40 (1016)

Figure 3. 7.5 ton heat pump, single compressor

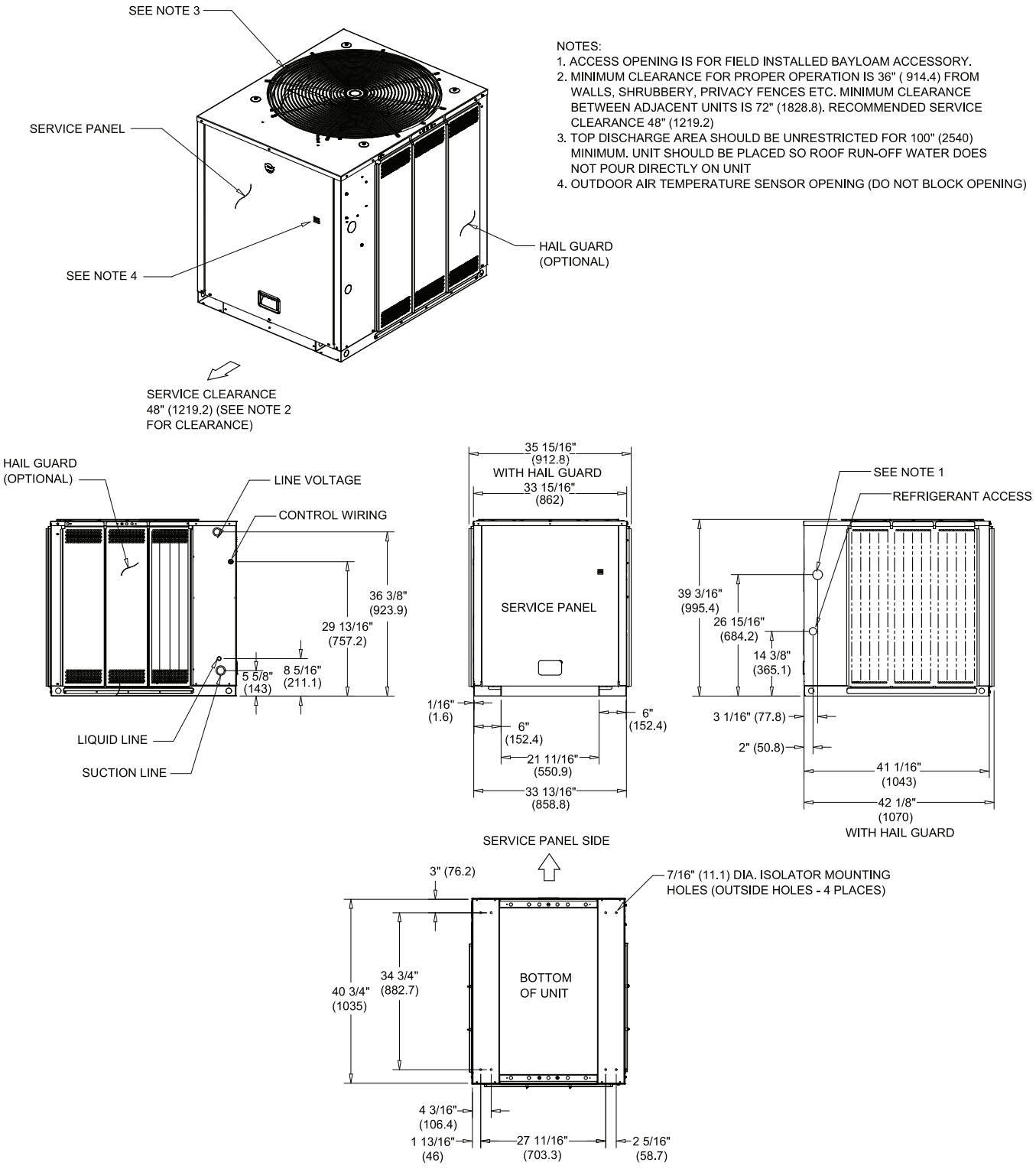

SEE NOTE 3
SERVICE PANEL
SEE NOTE 4
HAIL GUARD (OPTIONAL)
SERVICE CLEARANCE 48" (1219.2) (SEE NOTE 2 FOR CLEARANCE)
NOTES:
1. ACCESS OPENING IS FOR FIELD INSTALLED BAYLOAM ACCESSORY.
2. MINIMUM CLEARANCE FOR PROPER OPERATION IS 36" (914.4) FROM WALLS, SHRUBBERY, PRIVACY FENCES ETC. MINIMUM CLEARANCE BETWEEN ADJACENT UNITS IS 72" (1828.8). RECOMMENDED SERVICE CLEARANCE 48" (1219.2)
3. TOP DISCHARGE AREA SHOULD BE UNRESTRICTED FOR 100" (2540) MINIMUM. UNIT SHOULD BE PLACED SO ROOF RUN-OFF WATER DOES NOT POUR DIRECTLY ON UNIT
4. OUTDOOR AIR TEMPERATURE SENSOR OPENING (DO NOT BLOCK OPENING)
HAIL GUARD (OPTIONAL)
LINE VOLTAGE
CONTROL WIRING
36 3/8" (923.9)
29 13/16" (757.2)
5 5/8" (143)
8 5/16" (211.1)
LIQUID LINE
SUCTION LINE
35 15/16" (912.8)
WITH HAIL GUARD
33 15/16" (862)
SERVICE PANEL
1/16" (1.6)
6" (152.4)
6" (152.4)
21 11/16" (550.9)
33 13/16" (858.8)
SEE NOTE 1
REFRIGERANT ACCESS
39 3/16" (995.4)
26 15/16" (684.2)
14 3/8" (365.1)
3 1/16" (77.8)
2" (50.8)
41 1/16" (1043)
42 1/8" (1070)
WITH HAIL GUARD
SERVICE PANEL SIDE
3" (76.2)
7/16" (11.1) DIA. ISOLATOR MOUNTING HOLES (OUTSIDE HOLES - 4 PLACES)
40 3/4" (1035)
34 3/4" (882.7)
BOTTOM OF UNIT
4 3/16" (106.4)
1 13/16" (46)
27 11/16" (703.3)
2 5/16" (58.7)

Figure 4. 10 ton heat pump, single compressor

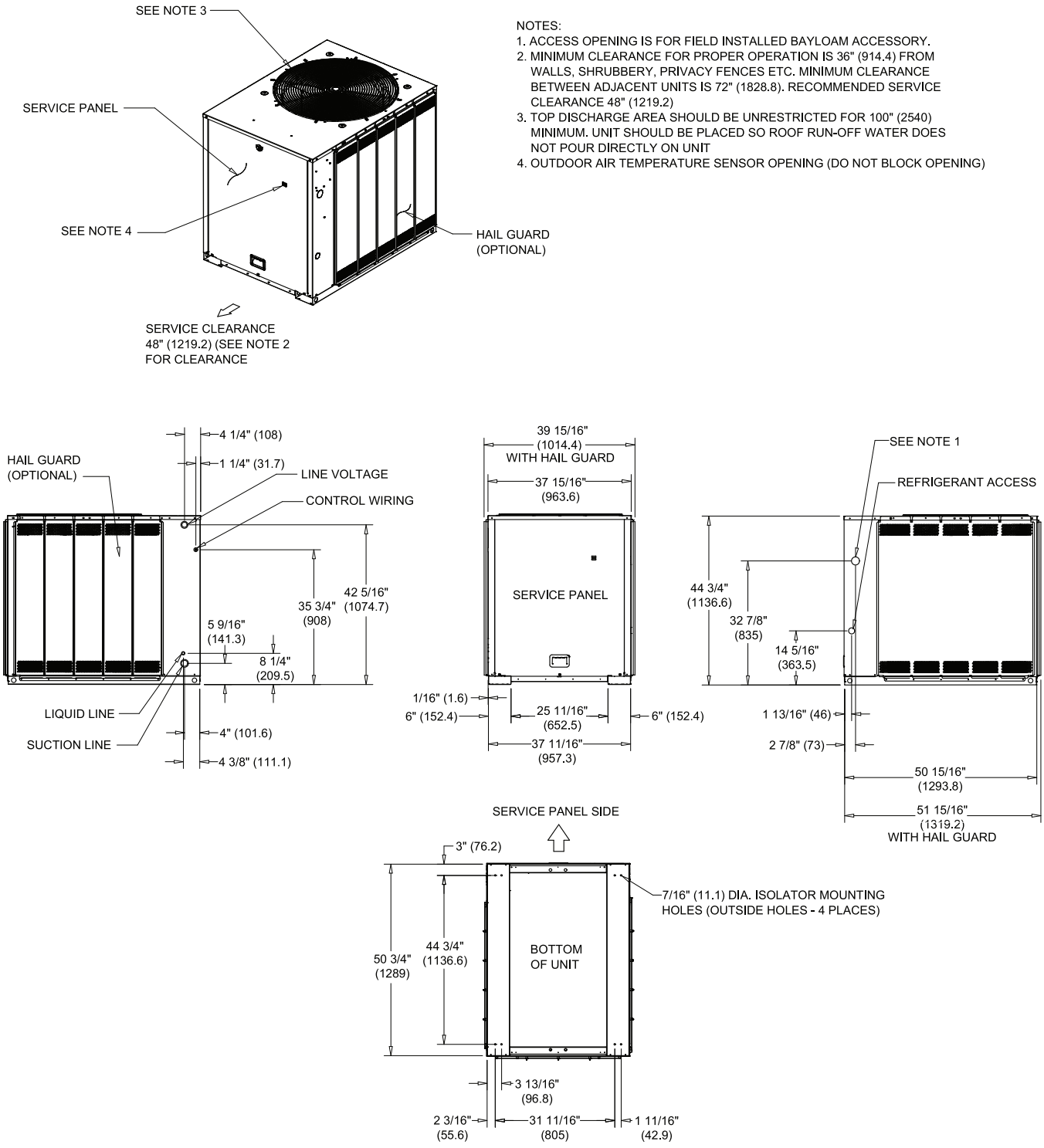
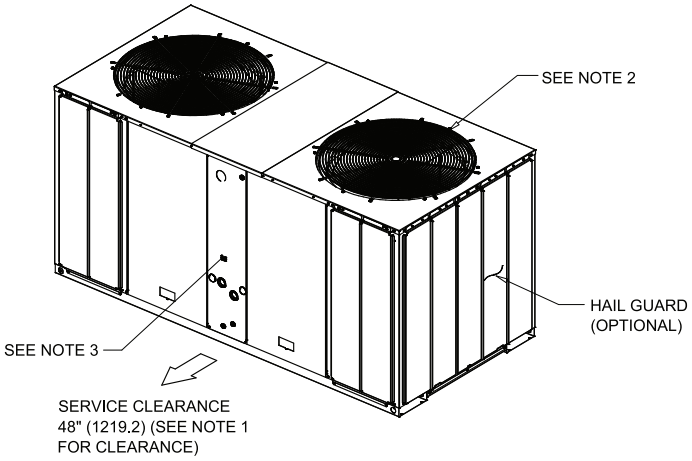
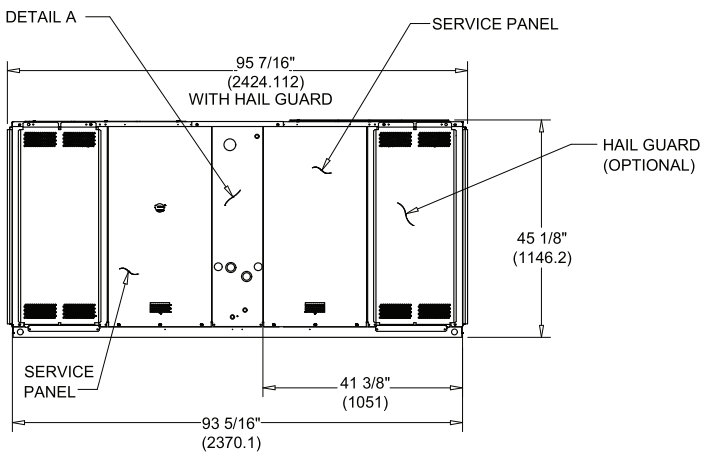
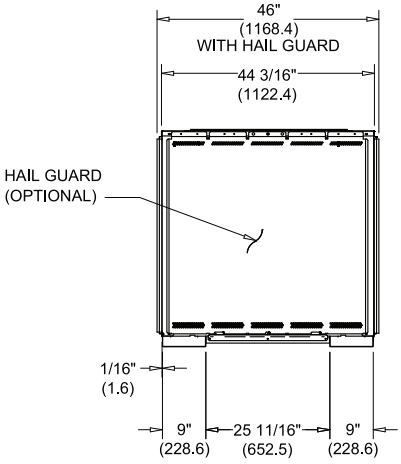


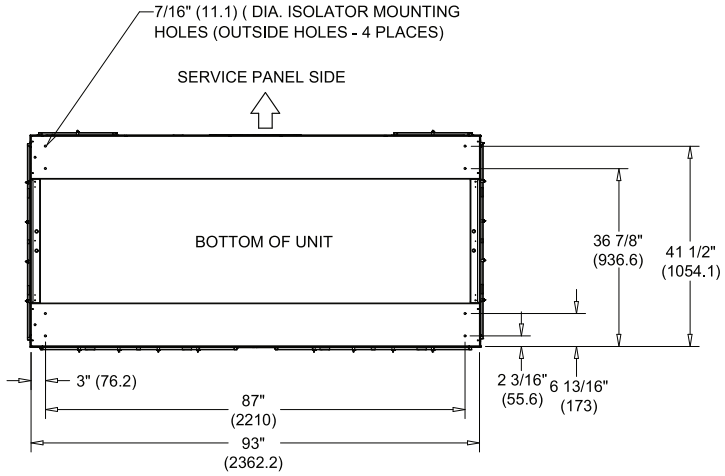
Figure 5. 15, 20 ton heat pump, dual compressor

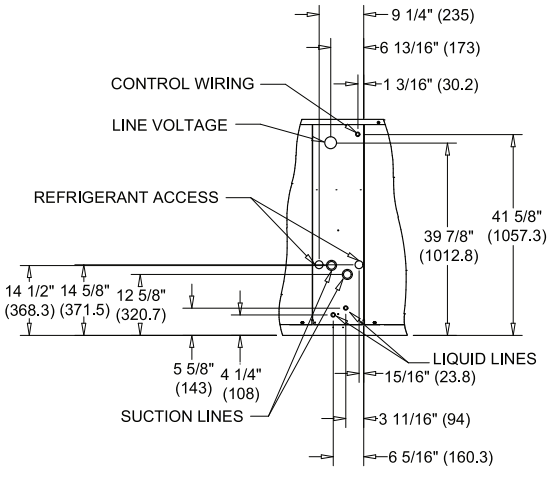


NOTES:
1. MINIMUM CLEARANCE FOR PROPER OPERATION IS 36" (914.4) FROM WALLS, SHRUBBERY, PRIVACY FENCES ETC. MINIMUM CLEARANCE BETWEEN ADJACENT UNITS IS 72" (1829). RECOMMENDED SERVICE CLEARANCE 48" (1219.2)
2. TOP DISCHARGE AREA SHOULD BE UNRESTRICTED FOR 100" (2540) MINIMUM. UNIT SHOULD BE PLACED SO ROOF RUN-OFF WATER DOES NOT POUR DIRECTLY ON UNIT
3. OUTDOOR AIR TEMPERATURE SENSOR OPENING (DO NOT BLOCK OPENING).









FRONT DETAIL A
DIMENSIONAL DETAIL

Weights

Heat Pump Condenser

Table 1. TWA unit and corner weights — lbs (60 Hz)

Tons	Model No.	Shipping Max (lbs)	Net Max (lbs)	Corner Weights			
				1	2	3	4
7.5	TWA090A	394	340	117	86	58	79
10	TWA120A	509	438	127	121	72	118
15	TWA180B	898	765	202	192	181	190
20	TWA240B	981	848	254	266	147	181

Figure 6. TWA090, 120

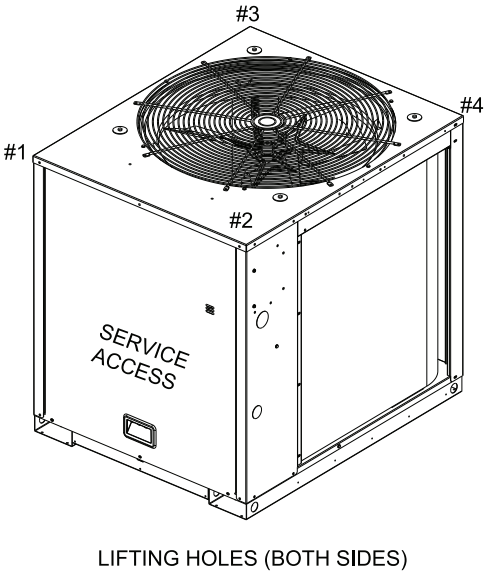
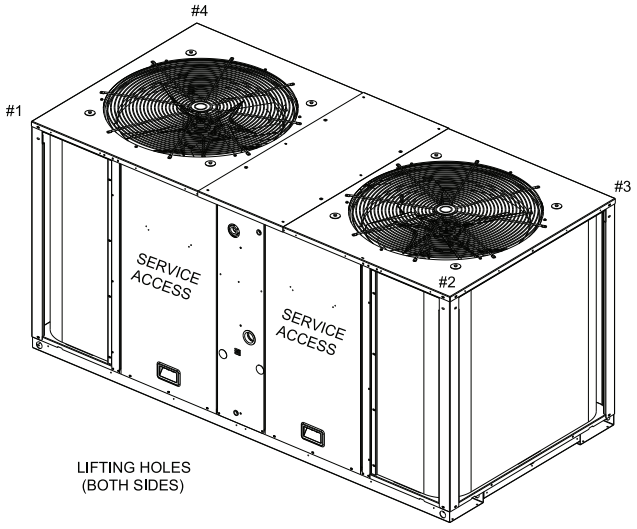


Figure 7. TWA180, 240



Installation

Refrigerant Piping Guidelines

Figure 8. Allowable elevation difference: Cooling only TTA *above* indoor unit

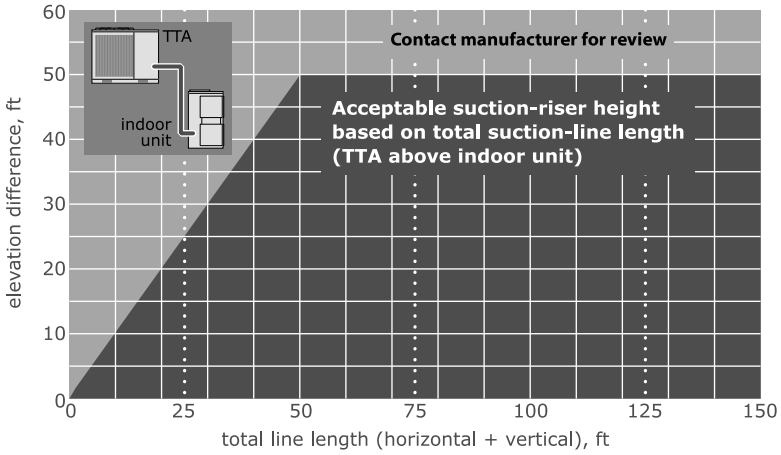
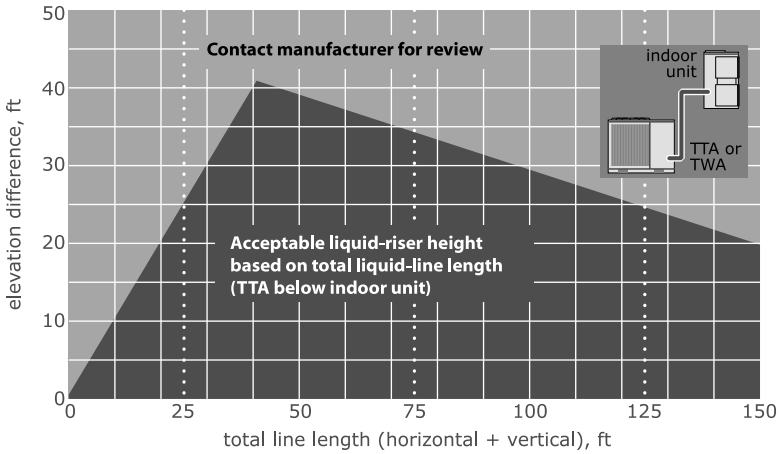


Figure 9. Allowable elevation difference: TTA *below* indoor unit



Note: *Route refrigerant piping for minimum linear length, minimum number of bends and fittings (no reducers) and minimum amount of line exposed to outdoor ambients.*

Refrigerant Piping Procedures (Outdoor Units)

⚠ WARNING

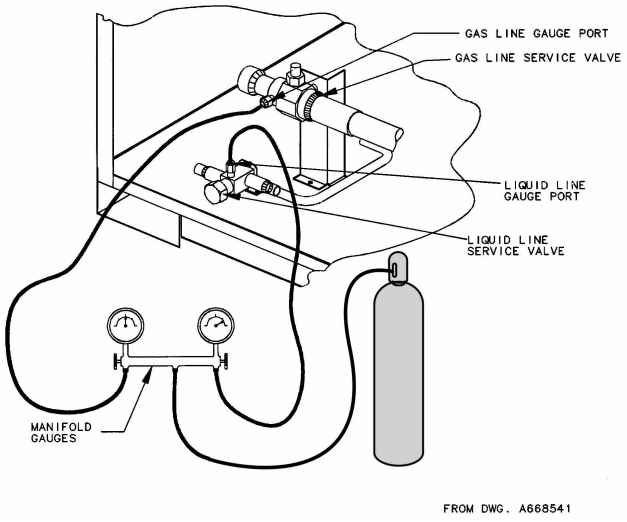
R-410A Refrigerant under Higher Pressure than R-22!

Failure to use proper equipment or components as described below, could result in equipment failing and possibly exploding, which could result in death, serious injury, or equipment damage.
The units described in this manual use R-410A refrigerant which operates at higher pressures than R-22. Use ONLY R-410A rated service equipment or components with these units. For specific handling concerns with R-410A, please contact your local Trane representative.

Each TTA unit ships with a holding charge of dry nitrogen. The nitrogen should be removed and the entire system evacuated (at the proper time) to avoid possible contamination.

1. Remove the compressor service access panel.
2. Locate the liquid and suction line service valves. Check that the piping connection stubs on the valves (Figure 10, p. 16) line up properly with the holes in the unit cabinet.

Figure 10. Outdoor units - refrigerant piping (with dry nitrogen)



3. Remove the refrigerant connection seal caps and open the service valve slowly to release the nitrogen from the unit.

NOTICE

System Component Damage!

Do not remove the seal caps from refrigerant connections, or open the service valves until prepared to braze refrigerant lines to the connections. Excessive exposure to atmosphere (> 5 min.) may allow moisture or dirt to contaminate the system, damaging valve seals and causing ice formation in system components.

⚠ WARNING

Hazard of Explosion and Deadly Gases!

Failure to follow all proper safe refrigerant handling practices could result in death or serious injury.
Never solder, braze or weld on refrigerant lines or any unit components that are above atmospheric pressure or where refrigerant may be present. Always remove refrigerant by following the guidelines established by the EPA Federal Clean Air Act or other state or local codes as appropriate. After refrigerant removal, use dry nitrogen to bring system back to atmospheric pressure before opening system for repairs. Mixtures of refrigerants and air under pressure may become combustible in the presence of an ignition source leading to an explosion. Excessive heat from soldering, brazing or welding with refrigerant vapors present can form highly toxic gases and extremely corrosive acids.

4. Cut, fit and braze tubing, starting at the outdoor unit and work toward the indoor unit. See recommended tube sizes, Table 3, p. 18.

   Note: *Use long radius ells for all 90° bends.*

   All brazing should be done using a 2 to 3 psig dry nitrogen purge flowing through the pipe being brazed, see Figure 10, p. 16.

NOTICE

System Component Damage!

Install a regulating valve between the nitrogen source and the gauge manifold. Unregulated pressure can damage system components.

NOTICE

System Component Damage!

Wet-wrap all valves and protect painted surfaces from excessive heat. Heat can damage system components and the unit finish.

5. Shut off nitrogen supply. Shut off the manifold valve for the line that is connected to the suction line service valve. Disconnect the line from the gauge port on the valve.

Refrigerant Piping Procedures (Indoor Unit)

Once liquid and suction lines are complete to the refrigerant connections on the indoor unit, remove the gauge port core(s) on the indoor unit connection stubs to release the dry nitrogen charge.

NOTICE

Unit Damage!

Do not apply heat to remove seal caps until the gauge port cores have been removed. If seal caps are intact, application of heat may generate excessive pressure in the unit and result in damage to the coil or expansion valve.

1. Remove both seal caps from the indoor unit connection stubs.

NOTICE

Unit Damage!

Do not remove the seal caps from refrigerant connections, or open the service valves until prepared to braze refrigerant lines to the connections.

2. Turn on nitrogen supply. Nitrogen enters through the liquid line gauge port.
3. Braze the liquid line connections.
4. Open the gauge port on the suction line and then braze the suction line to the connection stub. Nitrogen will bleed out the open gauge port on the suction line.
5. Shut off nitrogen supply.

Leak Check

⚠ WARNING

Hazard of Explosion!

Failure to follow these recommendations could result in death or serious injury or equipment or property-only damage.

Use only dry nitrogen with a pressure regulator for pressurizing unit. Do not use acetylene, oxygen or compressed air or mixtures containing them for pressure testing. Do not use mixtures of a hydrogen containing refrigerant and air above atmospheric pressure for pressure testing as they may become flammable and could result in an explosion. Refrigerant, when used as a trace gas should only be mixed with dry nitrogen for pressurizing units.

⚠ WARNING

Hazard of Explosion!

Failure to follow recommended safe leak test procedures could result in death or serious injury or equipment or property-only-damage.

Never use an open flame to detect gas leaks. Use a leak test solution for leak testing.

After the brazing operation of refrigerant lines to both the outdoor and indoor unit is completed, the field brazed connections must be checked for leaks. Pressurize the system through the service valve with dry nitrogen to 200 psi. Use soap bubbles or other leak-checking methods to ensure that all field joints are leak free. If not, release pressure, repair and repeat leak test.

System Evacuation

1. After completion of leak check, evacuate the system.
2. Attach appropriate hoses from manifold gauge to gas and liquid line pressure taps.

   Note: *Unnecessary switching of hoses can be avoided and complete evacuation of all lines leading to sealed system can be accomplished with manifold center hose and connecting branch hose to a cylinder of R–22 and vacuum pump.*
3. Attach center hose of manifold gauges to vacuum pump.

NOTICE

Operating Under Vacuum!

Do not operate or apply power to the compressor while under a vacuum. Failure to follow these instructions will result in compressor failure.

4. Evacuate the system to hold a 500 micron vacuum.
5. Close off valve to vacuum pump and observe the micron gauge. If gauge pressure rises above 500 microns in one minute, then evacuation is incomplete or the system has a leak.
6. If vacuum gauge does not rise above 500 microns in 10 minutes, the evacuation should be complete.

NOTICE

Equipment Damage!

Charge with access port on the liquid line service valve only.

7. With vacuum pump and micron gauge blanked off, open valve on R–22 cylinder and allow refrigerant pressure to build up to about 80 psig.
8. Close valve on the R–22 supply cylinder. Close valves on manifold gauge set and remove refrigerant charging hoses from liquid and gas

gauge ports.

9. Leak test the entire system. Using proper procedures and caution, as described in the previous section, repair any leaks found and repeat the leak test.

Insulating and Isolating Refrigerant Lines

Insulate the entire suction line with refrigerant piping insulation. Also insulate any portion of the liquid line exposed to temperature extremes. Insulate and isolate liquid and suction lines from each other. Isolate refrigerant lines from the structure and any duct work.

Important:

1. *To prevent possible noise or vibration problems, be certain to isolate refrigerant lines from the building.*
2. *All suction and hot gas bypass piping (if installed) should be insulated from the termination in the air handler to the condensing unit cabinet entry. Failure to do so can cause condensate drip off and performance degradation.*
3. *Prior to starting a unit, it is advisable to have the approved oils available in the event oil needs to be added to the system.*

NOTICE

Equipment Damage!

This is POE oil, which readily absorbs moisture. Always use new oil and never leave containers open to atmosphere while not in use.

Table 2. R-22 TWA approved oils

Unit Model Number	Approved Oils
TWA090A, TWA120A, TWA180B, TWA240B	Trane Oil Part Number OIL00027 (1 quart container)

For units equipped with compressors containing site glasses, the oil level must be visible through the sight glass when the compressor is running under stabilized conditions and a few minutes after the compressor has stopped.

Refrigerant Charging Procedure

If charging by weight, refer to Table 3, p. 18 for starting change. If refrigerant adjustments are needed because of length of line, refer to "Charging Charts and Superheat," p. 25.

Charge by weight through the gauge port on the liquid line. Once the charge enters the system, backseat (open) the liquid line service valve and disconnect the charging line and replace the cap on the gauge port.

Notes:

- *R-22 should only be charged in the liquid state.*
- *When possible, always charge the refrigerant into the liquid line of the unit.*
- *If the entire charge can't be charged into the liquid line, the balance of the unit charge can be metered through a charging manifold set as liquid — preferably through a schrader valve into the suction line to the compressor — only while the compressor is running.*
- *Check and adjust superheat using Table 6, p. 25, then re-check charging charts to determine if charge corrections are necessary.*

NOTICE

Equipment Damage!

Never charge liquid refrigerant into the suction line of the unit with the compressor off.

Figure 11. Outdoor units - refrigerant piping

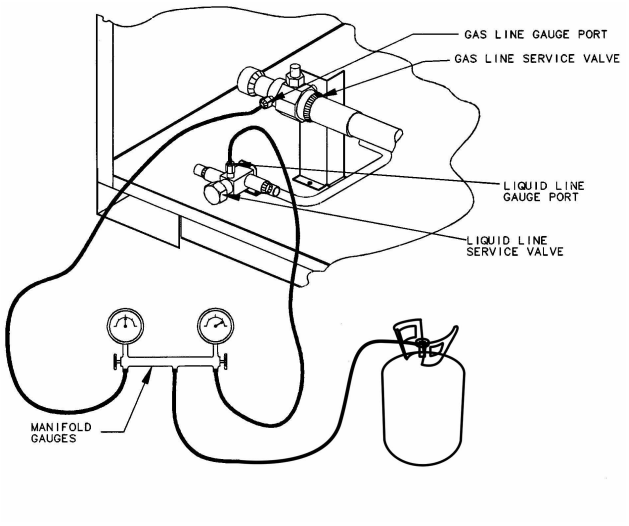


Table 3. Estimated charge levels at ARI rated line lengths (25 feet)

Matched Set	Refrigerant Charge		Per Circuit	
	Circuit 1	Circuit 2	Liquid Line Diameter	Vapor Line Diameter
TWA090A w/TWE090A	20.6	NA	0.625 (5/8″)	1.375 (1 3/8″)
TWA120A w/TWE120A	27.9	NA	0.5 (1/2″)	1.375 (1 3/8″)
TWA180B w/ TWE180B	22.9	24.2	0.5 (1/2")	1.375 (1 3/8")
TWA240B w/ TWE240B	23.5	23.5	0.625 (5/8")	1.375 (1 3/8")

Liquid Charging

This procedure is accomplished with the unit operating. Electrical connections must be complete. Do not proceed until the system is ready to operate.

Note: *The compressor access panel must be installed when the unit is running and being charged. Manifold hoses must be routed through refrigerant gauge access hole(s). See "Dimensional Data," p. 10 for specific locations.*

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.

When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

1. Turn on power to the unit. Allow the system to run for 15 minutes to stabilize operating conditions.
2. Measure airflow across the indoor coil. Compare the measurements with the fan performance data in the Data/Submittal or Service Facts. Once proper airflow is established, compare discharge pressure and liquid temperature to the "Charging Charts," p. 25. Add or remove refrigerant (liquid only) as required to obtain correct discharge pressure and liquid temperature.
3. Check suction line superheat and condenser sub-cooling to ensure the unit is operating properly.
4. Disconnect all power to the unit.

   Important: *If the unit is charged and left without power until a later date, the crankcase heater should be energized for a minimum of 8 hours prior to powering the compressor(s).*

⚠ WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.

For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN.

5. Remove the charging system from the unit.
6. Replace all panels.

Electrical Wiring

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/state electrical codes.

Field wiring consists of providing power supply to the unit, installing the system indoor thermostat and providing low voltage system interconnecting wiring. Access to electrical connection locations is shown in "Dimensional Data," p. 10. Determine proper wire sizes and unit protective fusing requirements by referring to the unit nameplate and/or the unit Service Facts. Field

wiring diagrams for accessories are shipped with the accessory.

Unit Power Supply

The installer must provide line voltage circuit(s) to the unit main power terminals as shown by the unit wiring diagrams (available through e-Library or by contacting a local sales office) or field wiring. Power supply must include a disconnect switch in a location convenient to the unit. Ground the unit according to local codes and provide flexible conduit if codes require and/or if vibration transmission may cause noise problems.

Important: *All wiring must comply with applicable local and national (NEC) codes. Type and location of disconnect switches must comply with all applicable codes.*

⚠ WARNING

Proper Field Wiring and Grounding Required!

Failure to follow code could result in death or serious injury.

All field wiring MUST be performed by qualified personnel. Improperly installed and grounded field wiring poses FIRE and ELECTROCUTION hazards. To avoid these hazards, you MUST follow requirements for field wiring installation and grounding as described in NEC and your local/ state electrical codes.

NOTICE

Use Copper Conductors Only!

Failure to use copper conductors could result in equipment damage as unit terminals are not designed to accept other types of conductors.

Low Voltage Wiring

Mount the indoor thermostat, zone sensor, or Night Setback Panel (NSB) in accordance with the corresponding thermostat installation instructions. Install color-coded, weather-proof, multi-wire cable according to the field wiring schematics (see "Field Wiring", p. 21).

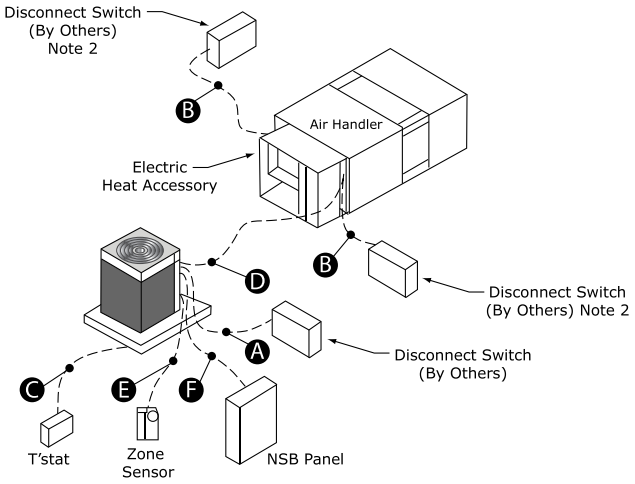
ReliaTel™ Controls

Wiring shown with dashed lines is to be furnished and installed by the customer. All customer supplied wiring must be copper only and must conform to NEC and local electrical codes. Codes may require line of sight between disconnect switch and unit.

Notes:

1. *When electric heater accessory is used, single point power entry or dual point power entry is field optional. Single point power entry option is through electric heater only.*
2. ****Choose only one of the following; Thermostat, Zone Sensor, or NSB Panel.*

Figure 12. ReliaTel jobsite connections



A. 3 power wires, line voltage for 3 phase, (2 power wires for single phase)
B. 3 power wires, line voltage for 3 phase, (2 power wires for single phase)
C. Heat Pump thermostat: 5 to 8 wires depending on stages of electric heat
D. 3 to 7 wires depending on type of outdoor unit(s)
E. Zone Sensor: 4 to 10 wires depending on zone sensor model[a]
F. Night Setback Panel: 7 wires

[a] For SZVAV air handlers: 4 additional wires are required (2 of which require twisted pair or shielded wire) in order to make connections between ReliaTel boards in the condenser and air handler.

Field Wiring

Figure 13. Night setback panel field wiring

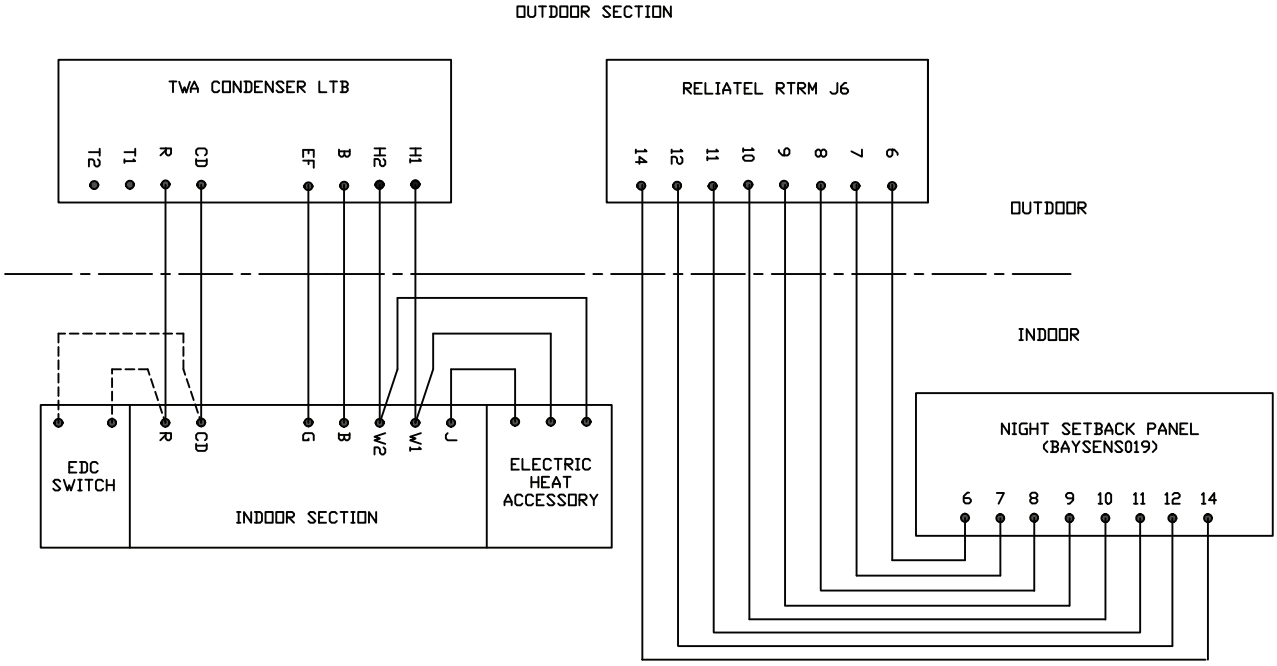


Figure 14. Zone sensor field wiring

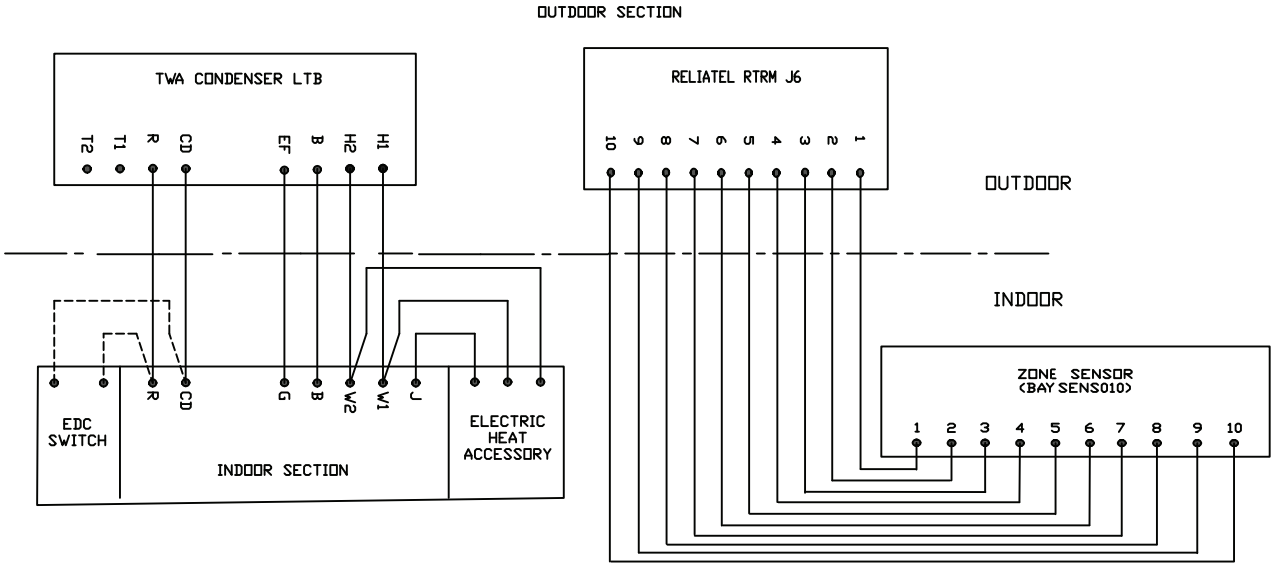
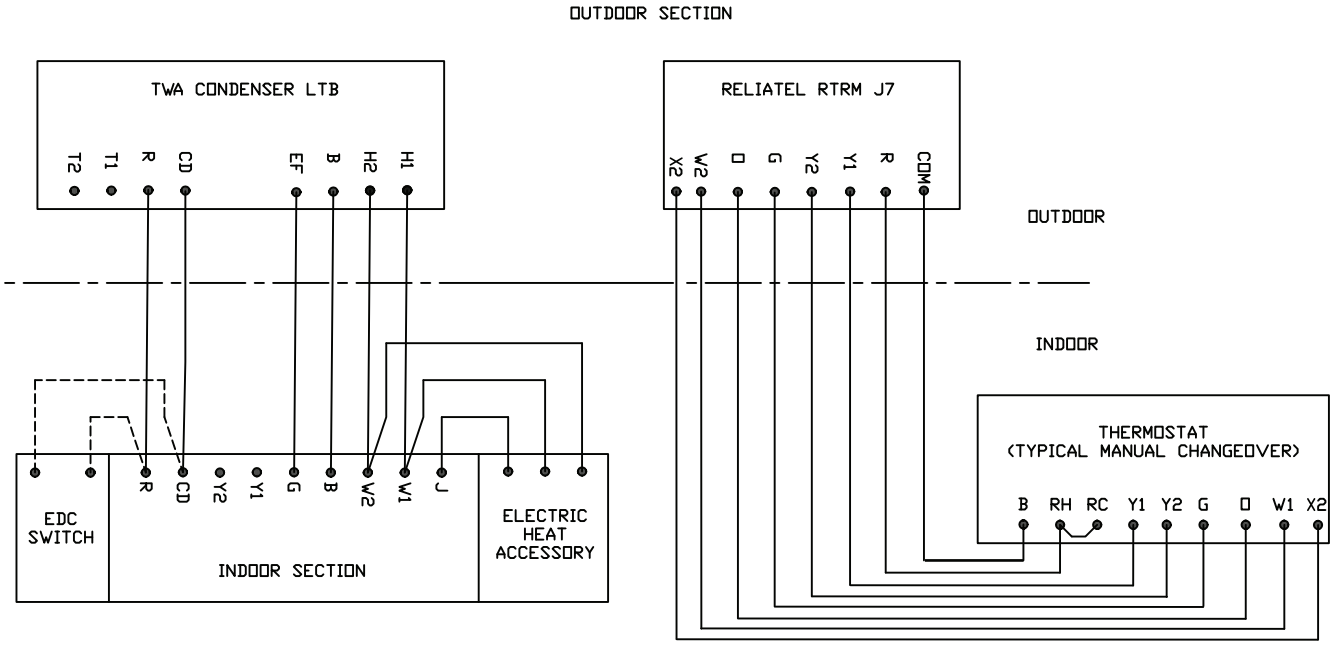


Figure 15. Thermostat field wiring



Refrigerant Circuit

Figure 16. Typical split system heat pump - cooling - refrigerant circuit

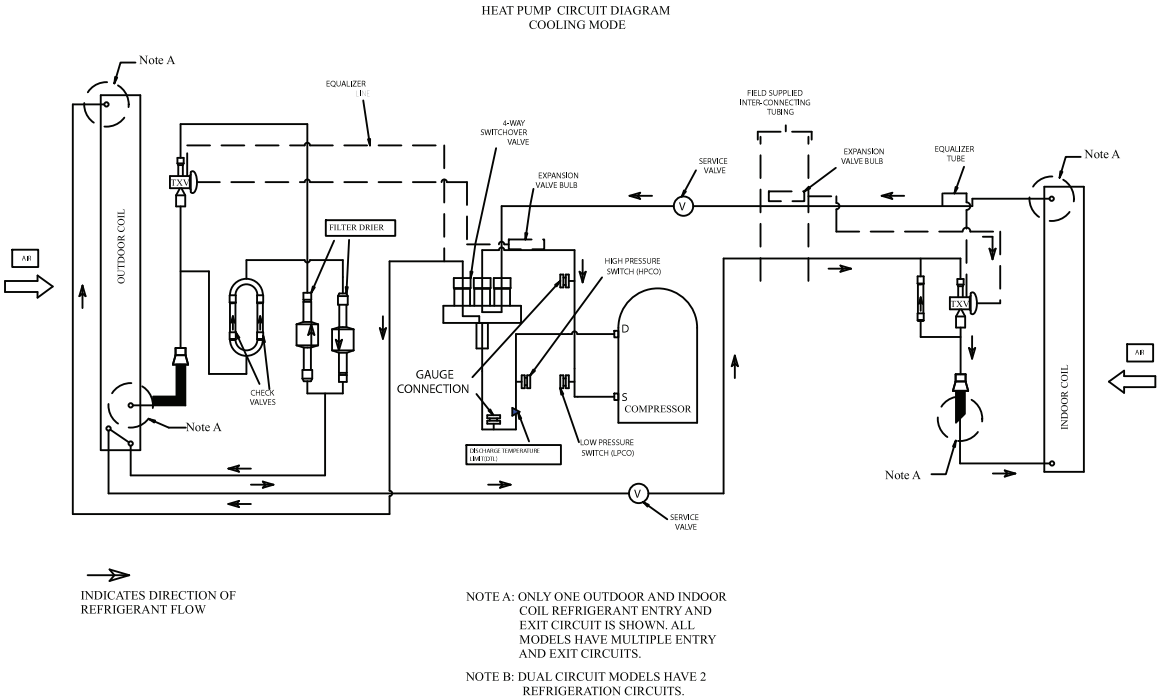
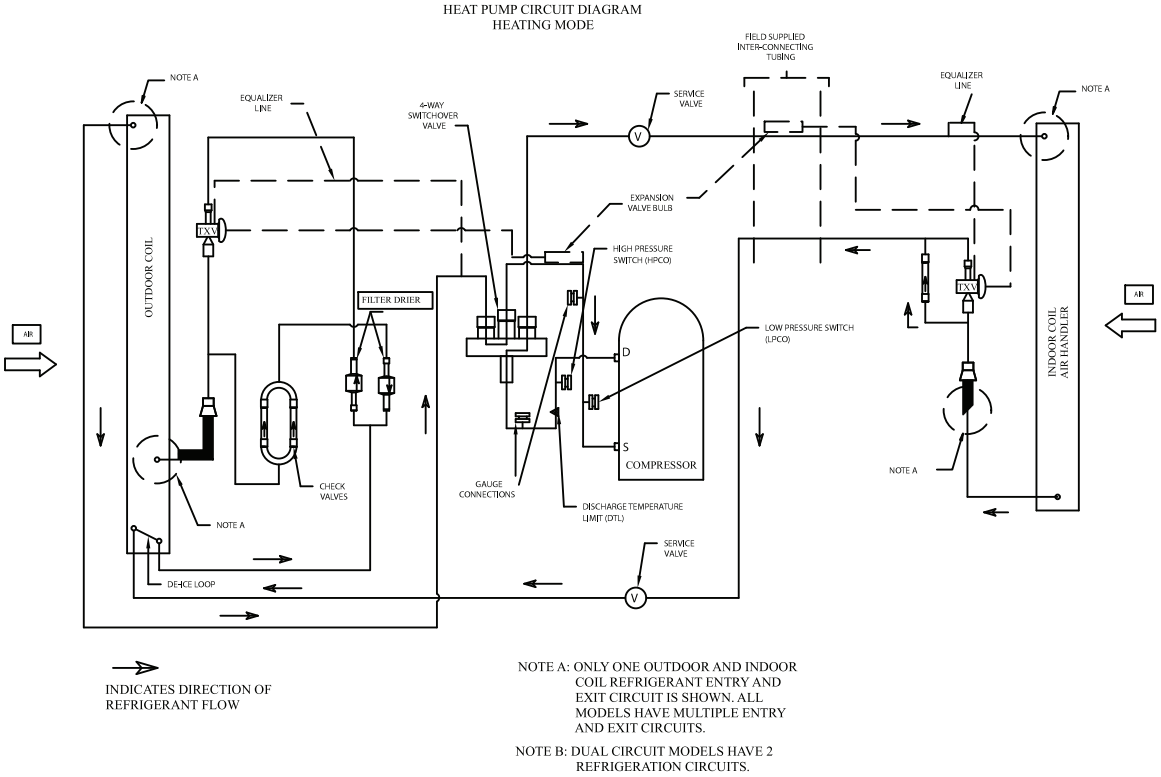


Figure 17. Typical split system heat pump - heating - refrigerant circuit



Electrical Data

Table 4. Electrical characteristics — motors — heat pumps — 60 Hz

Tons	Unit Model Number	Compressor Motor					Condenser Fan Motor				
		No.	Volts	Phase	Amps		No.	Volts	Phase	Amps	
					RLA (Ea.)	LRA (Ea.)				FLA (Ea.)	LRA (Ea.)
7.5	TWA090A3	1	208-230	3	22.4	164	1	208-230	1	3.1	8.1
	TWA090A4	1	460	3	10.9	100	1	460	1	1.6	3.8
10	TWA120A3	1	208-230	3	30.1	225	1	208-230	1	5.0	14.4
	TWA120A4	1	460	3	15.5	114	1	460	1	2.5	5.8
15	TWA180B3	1	208-230	3	22.4	164	2	208-230	2	5.0	14.4
	TWA180B4	1	460	3	10.9	100	2	460	2	2.5	5.8
20	TWA240B3	1	208-230	3	30.1	225	2	208-230	2	5.0	14.4
	TWA240B4	1	460	3	15.5	114	2	460	2	2.5	5.8

Note: Electrical characteristics reflect nameplate values and are calculated in accordance with cULus and ARI specifications.

Table 5. Unit wiring — heat pumps — 60 Hz

Tons	Unit Model Number	Unit Operating Voltage Range	Minimum Circuit Ampacity	Maximum Fuse or HACR Circuit Breaker Size
7.5	TWA090A3	187-253	31.1	45
	TWA090A4	414-506	15.2	25
10	TWA120A3	187-253	42.6	60
	TWA120A4	414-506	21.9	30
15	TWA180B3	187-253	60.4	80
	TWA180B4	414-506	29.5	40
20	TWA240B3	187-253	77.7	100
	TWA240B4	414-506	39.9	50

Note: HACR type circuit breaker per NEC.

Charging Charts and Superheat

Figure 18. TWA090A

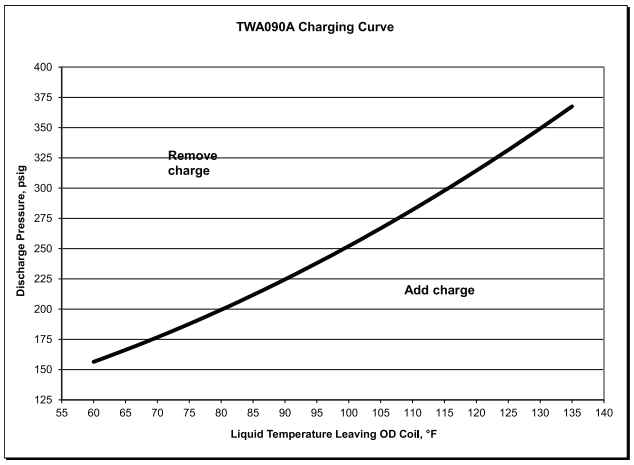


Figure 19. TWA120A

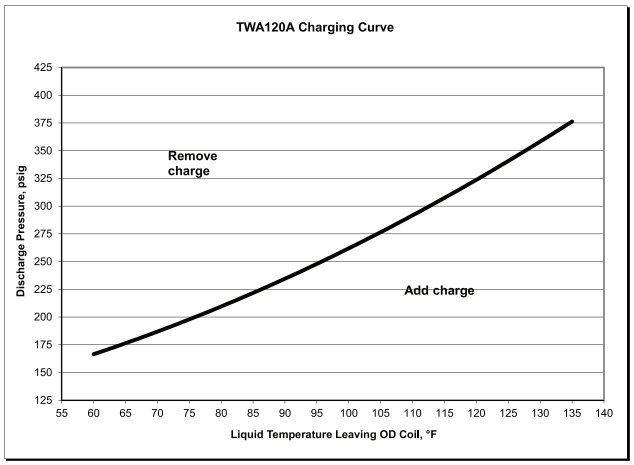


Figure 20. TWA180B

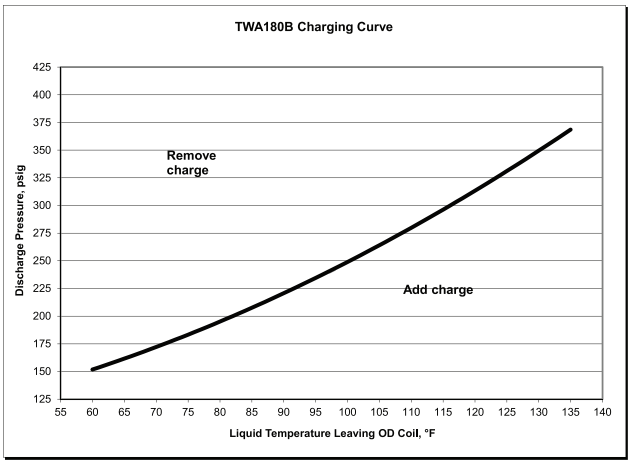


Figure 21. TWA240B

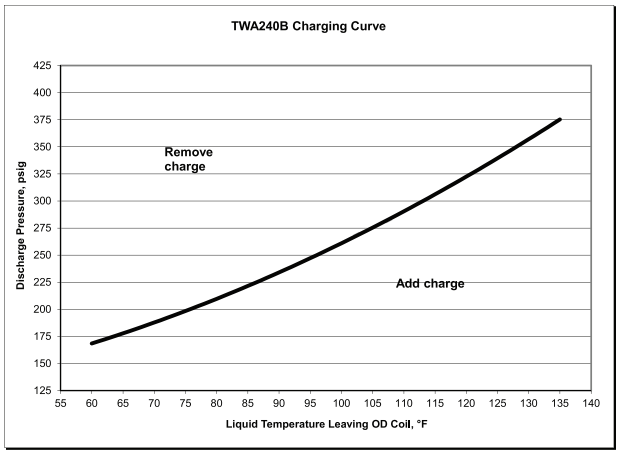


Table 6. TWA superheat with matched TWE air handler

Condenser	Air Handler	Cooling Superheat		Heating Superheat	
		Circuit 1	Circuit 2	Circuit 1	Circuit 2
TWA090A	TWE090A	16.0	—	15.7	—
TWA120A	TWE120A	16.3	—	13.1	—
TWA180B	TWE180B	15.5	15.5	12.2	12.2
TWA240B	TWE240B	14.7	14.7	11.4	11.4

Notes:

1. An adjustable TXV is provided for each circuit in the TWE and TWA models. If the application causes the superheat to deviate from the values shown above by more than 1 degree - after the system has achieved steady state - the TXV should be adjusted to provide the values shown as measured at the compressor.
2. The values given above have been tested and are approved for the matched sets shown. If an alternate combination is used, an expansion device should be used that provides 16-20°F degrees of superheat measured at the compressor.
3. Check and adjust superheat using this table, then compare with charging chart to determine if charge corrections are necessary.

Installation Checklist

Complete this checklist once the unit is installed to verify that all recommended procedures have been accomplished before starting the system. Do not operate the system until all items covered by this checklist are complete.

- ☐ Inspect unit location for proper required service clearances.
- ☐ Inspect unit location for proper free air clearances.
- ☐ Inspect unit location for secure, level mounting position.

Refrigerant Piping

- ☐ Properly sized/constructed liquid and suction lines connected to stubs at both the indoor and outdoor units?
- ☐ Insulated the entire suction line?
- ☐ Insulated portions of liquid line exposed to extremes in temperature?
- ☐ Performed initial leak test?
- ☐ Evacuated each refrigerant circuit to 500 microns?
- ☐ Charged each circuit with proper amount of R-22?

Electrical Wiring

- ☐ Provided unit power wiring (with disconnect) to proper terminals in the unit control section?
- ☐ Installed system indoor thermostat?
- ☐ Installed system low voltage interconnecting wiring to proper terminals of outdoor unit, indoor unit and system thermostat?

Pre-Start

Control Circuit Features

Note: *Not all of these features may be required for your unit, check electrical schematic.*

Discharge Temperature Limit (DTL)

The control's sensor is located on the discharge line. This device will shut off the compressor and the outdoor fan(s) if the discharge temperature exceeds the DTL setting. Once the discharge temperature has returned to normal, the compressor will cycle back on.

Evaporator Defrost Control (EDC)

This control is located in the Air Handler. The control's sensing tube is embedded vertically in the evaporator coil, near the center. This device will stop the compressor if the indoor coil temperature drops below its setting. The indoor air will still circulate across the coil bringing the temperature of the coil back up to the cut-in temperature of the evaporator defrost control.

Low Pressure Cut-Out (LPCO)

This control's sensor is located in the suction (gas) line, near the compressor. This control will stop the compressor and the outdoor fans if suction pressure drops below the Low Pressure Cut-Out setting. Once the suction pressure has returned to normal, the compressor and outdoor fans will cycle back on.

High Pressure Cut-Out (HPCO)

This control's sensor is located in the discharge line. This device will shut off the compressor and the outdoor fan(s) if the discharge pressure exceeds the High Pressure Cut-Out's setting. Once the discharge pressure has returned to normal, the compressor will cycle back on.

⚠ WARNING

Prevent Injury!

Due to agency safety requirements, no schrader core is to be installed beneath the HPCO. Removal of the HPCO without evacuating the system charge could cause injury and release of refrigerant.

Internal Overload Protector (IOL)

This device is embedded in the compressor. It will shut off the compressor if the discharge temperature of the compressor exceeds its design trip temperature.

Note: *The IOL will put the compressor back in operation once the compressor motor heat has dropped below the trip setting; however, a check of the refrigerant and electrical systems should be made to determine the cause and be corrected.*

Start-Up

ReliaTel™ Controls

The ReliaTel™ Control is a microelectronic control feature, which provides operating functions that are significantly different than conventional Electromechanical units. The ReliaTel™ Refrigeration Module (RTRM) uses proportional/integral control algorithms to perform specific unit functions that govern the unit operation in response to application conditions.

The RTRM provides compressor anti-short cycle (ASC) timing functions through minimum **"Off"** and **"On"** timing to increase reliability, performance and to maximize unit efficiency. Upon power initialization, the RTRM performs self-diagnostic checks to insure that all internal controls are functioning. It also checks the configuration parameters against the components connected to the system. The system LED located on the RTRM module is turned **"On"** within one second after power-up if all internal operations are correct.

The heating and cooling cycles of the heat pump are automatic for Heat and Cool functions when using an optional automatic changeover thermostat (TS).

The fan switch on the optional automatic changeover thermostat can be placed in either the **ON** position, causing continuous evaporator (indoor) fan operation, or the **AUTO** position causing fan operation to coincide with heating or cooling run cycles. (In **AUTO** position, the fan switch automatically changes to Heat or Cool in response to sufficient room temperature change.)

Terminology

The following terms and acronyms may be used in this section.

ASC	Anti-Short Cycle Timer
CC	Compressor Contactor
CCH	Crankcase Heater
CF	Outdoor Fan Capacitor
CHR	Crankcase Heater Relay
COMM	Communication Interface Module
CPR	Compressor
CTS	Coil Temperature Sensor
DTL	Discharge Temperature Limit Switch
EDC	Evaporator Defrost Control Switch
FTB	Outdoor Fan Terminal Block
HPC	High Pressure Cutout Switch
HTB	High Voltage Terminal Block
LPC	Low Pressure Cutout Switch
LTB	Low Voltage Terminal Board
OAS	Outdoor Air Temperature Sensor
ODF	Outdoor Fan Relay
ODM	Outdoor Fan Motor
PM	Phase Monitor
RTRM	ReliaTel ™ Refrigeration Module
SOV	Switchover Valve
TNS	Transformer

Functions and Features

These subsections describe the following key heat pump functions and features:

- Processing Activated When the Disconnect Switch is in **ON** Position
- Mechanical Heat
- Auxiliary Heat
- Emergency Heat
- Cooling
- Demand Defrost

Processing Activated When the Disconnect Switch is in the ON Position

The following table lists the processing that occurs given the stated condition.

Condition	Resulting Operations
If the disconnect switch is in the **ON** position…	1. Current is supplied to the compressor crankcase heater(s) (CCH) through the normally closed contacts of the crankcase heater relay (CHR) when the compressor is not running.
	2. The phase monitor (PM) is powered.
	3. The phase monitor (PM) looks at the incoming power to verify that there is no reversed phase, no phase imbalance, and no loss of phase. If the phase monitor detects any of these three conditions, it will shut off control voltage.
	4. The control transformer (TNS) is powered.
	5. The ReliaTel ™ control board (RTRM) is powered and performs self-diagnostic checks to insure that all internal controls are functioning.
	6. The ReliaTel ™ control board (RTRM) checks the configuration parameters against the components connected to the system.
	7. The system LED located on the RTRM module is turned **ON** within one second after power-up if all internal operations are correct.
	8. The communications board (COMM) is powered if installed.
	9. The indoor thermostat (TS) is powered.

Mechanical Heat

In Heat mode the switchover valve (SOV) is turned **OFF**. When a request for heating occurs, the control system turns **ON** the mechanical heat (compressors) to perform heating. Dual circuit heat pumps are factory configured to have 2-step mechanical heating enabled (RTRM J4-3 tied to ground).

The staging sequence depends on the type of mechanical heating that is enabled.

- If 1-Step mechanical heating is enabled (RTRM J4-3 not tied to ground), the unit will stage according to Table 9, p. 31, as a result of the proportional/ integral control algorithms.
- Units with 2-step mechanical heating will stage according to Table 10, p. 31, as a result of the proportional/integral control algorithms.

With mechanical heating, when a heat request is turned **ON**, the Indoor Fan request is turned **ON**. When the heat request is turned **OFF**, the Indoor Fan request is turned **OFF** after a specified delay (60 seconds on all dual-compressor units and 80 seconds on all single compressor units). See Table 7, p. 30, Table 8, p. 31, Table 9, p. 31, and Table 10, p. 31 in this document for the staging, sequence, and control.

Auxiliary Heat

Auxiliary Heat is factory disabled on all Odyssey units (Jumper placed between J2-1 and J2-2 RTRM inputs). If configured (Jumper wire cut or removed between J2-1 and J2-2 on RTRM) and installed, Auxiliary Heat is enabled or disabled by Smart Recovery.

Smart Recovery

Smart Recovery dictates that if the Active Zone Temperature is making a recovery using only mechanical heating toward the setpoint at a rate of at least 6°F/hour (0.1°F/minute), the electric heat is disabled. If Smart Recovery is not disabling electric heat, an approximate 9 minute stage-up delay (plus or minus a few minutes) is provided for each stage to allow time for recovery to begin. Stages of electric heat are enabled and energized as necessary to meet heating demand. When the request for Auxiliary Heat is removed, the Indoor Fan request is turned **OFF** at the same time as the Electric Heat Stages. See Table 7, p. 30, Table 8, p. 31, Table 9, p. 31, and Table 10, p. 31 for the staging, sequence, and control.

All split system units are also configured from the factory for only 1-Stage of Electric Heat (Jumper placed between J1-3 and J1-6 RTRM inputs). To enable two stages of Electric Heat, cut or remove the jumper between J1-3 and J1-6 RTRM inputs.

Emergency Heat

When Emergency Heat mode is requested and Auxiliary Electric Heat is configured and installed, only the Auxiliary Electric Heat will be turned **ON** to satisfy the Heat request. Mechanical heat will be held **OFF**. When the request for Emergency Heat is initiated, the Indoor Fan request is turned **ON** 1 second before the electric heat stages are activated. See Table 7, p. 30, Table 8, p. 31, Table 9, p. 31, and Table 10, p. 31for the staging, sequence, and control.

Cooling

With a request for Cooling, the RTRM stages the circuits and control normally for single and dual stage

cooling applications. If the unit is configured with a zone sensor, switchover valve 1 (SOV1) and switchover valve 2 (SOV2) are energized for the duration of the Cooling mode and do not change states until the unit either enters **OFF** mode or transitions to Heat mode. If the unit is controlled with a thermostat, SOV1 and SOV2 are energized while the thermostat W1/O signal output to the RTRM is active.

The outdoor fans (ODF) will turn **ON** and **OFF** with the compressors. Circuit 1 fan cycles with compressor 1 and circuit 2 fan will cycle with compressor. If a compressor is turned **OFF**, the anti-short cycle timer (ASC) will hold the compressor **OFF** for 3 minutes. See Table 7, p. 30, Table 8, p. 31, Table 9, p. 31, and Table 10, p. 31 for the staging, sequence, and control.

Demand Defrost

When power is first applied to the unit, the first demand-defrost cycle will be initiated based on a cumulative run time of exactly 30 minutes only at the required conditions. The cumulative run time at the required conditions is tracked separately for each compressor.

Shortly after completion of the first defrost cycle, the system control calculates the temperature difference between the outdoor coil and outdoor air, using the result as an indicator of unit performance at dry coil conditions.

Conditions Triggering the Defrost Cycle

Over time, as moisture and frost accumulate on the coil, the coil temperature will drop, increasing the temperature difference. When the temperature difference is large enough, a defrost cycle is initiated. Demand Defrost is initiated when the outdoor air temperature (OAS) is below 52°F and the outdoor coil temperature (CTS) is below 33°F.

Single and Dual Circuits

When a circuit enters Defrost mode, the compressor will remain energized, the associated outdoor fan (ODF) will de-energize, the associated switchover valve (SOV) output will energize, and the first stage of Auxiliary Heat energizes.

On dual circuit units, the opposite circuit's state will remain unchanged if a defrost cycle has not been initiated on that circuit. Each circuit will enter defrost independently based on its associated Outdoor Coil Temperature Sensor (CTS), the Outdoor Air Temperature Sensor (OAS), and its total accumulated run time.

Termination of the Defrost Cycle

A circuit will leave defrost, during normal conditions, once the outdoor coil temperature reaches the outdoor air temperature + 47°F which must be above 57°F and not greater than 72°F. Termination of the defrost cycle includes a "Soft Start" delay of 5 seconds for the switchover valve (SOV) where the outdoor fans (ODF) are turned on 5 seconds before the switchover valve (SOV) is returned to the heating position to help smooth the transition.

Behavior of Switchover Valves

The switchover valves (SOV) will both be energized during cooling mode and will be de-energized during Heat or **OFF** mode. However, during a defrost cycle, only the circuit that requires a defrost cycle will energize its switchover valve (SOV). For thermostat control, if a thermostat is requesting for the switchover (SOV) to be energized or de-energized, both switchover valve (SOV) outputs will follow the thermostat request (unless a circuit is in a defrost cycle).

Defrost Configuration Facts

Units are configured from the factory to have Independent Circuit defrost (RTRM input J9-3 tied to ground with RTRM input J1-5 OPEN).

Table 7. Heat pump operation with thermostat

Inputs							Outputs		
Y1	**Y2**	**G**	**W1**	**W2**	**O**	**X2**	**Cool**	**Heat1**	**Indoor Fan**
ON	OFF	Don't Care	Don't Care	OFF	HEAT	OFF	OFF	Stage 1	ON
OFF	ON	Don't Care	Don't Care	OFF	HEAT	OFF	OFF	Stage 2	ON
ON	ON	Don't Care	Don't Care	OFF	HEAT	OFF	OFF	Stage 1 + Stage 2	ON
ON	OFF	Don't Care	Don't Care	ON	HEAT	OFF	OFF	Stage 1 + Auxiliary	ON
OFF	ON	Don't Care	Don't Care	ON	HEAT	OFF	OFF	Stage 2 + Auxiliary	ON
ON	ON	Don't Care	Don't Care	ON	HEAT	OFF	OFF	Stage 1 + Stage 2 + Auxiliary	ON

Table 7. Heat pump operation with thermostat (continued)

Inputs							Outputs		
Y1	**Y2**	**G**	**W1**	**W2**	**O**	**X2**	**Cool**	**Heat1**	**Indoor Fan**
Don't Care	Don't Care	Don't Care	Don't Care	Don't Care	Don't Care	ON	OFF	Em Heat	ON

Note: *Stage 1 = Circuit 1 and Stage 2 = Circuit 2*

Table 8. Heat pump operation with a zone sensor with lead/lag enabled

Heating Request	Circuit Output
0 (None)	All Off
1	Circuit 1
2	Circuit 2 + Circuit 1
3	Auxiliary Heat 1
4	Auxiliary Heat 2

Table 8. Heat pump operation with a zone sensor with lead/lag enabled (continued)

Heating Request	Circuit Output
0 (None)	All Off
1	Circuit 2 + Circuit 1
2	Circuit 1 + Circuit 2
3	Auxiliary Heat 1
4	Auxiliary Heat 2

Table 9. Heat pump control (1-step mechanical heating)

Active Unit Mode	Stage	Indoor Fan	Compressor	Auxiliary Heat 1	Auxiliary Heat 2	Switchover Valve 1	Switchover Valve 2[a]
Heat/Off	Off	Off	Off	Off	Off	Off	Off
Heat	Stage 1	On	Both Compressors	Off	Off	Off	Off
Heat	Auxiliary 1	On	Both Compressors	On	Off	Off	Off
Heat	Auxiliary 2	On	Both Compressors	On	On	Off	Off
Emergency Heat	Stage 1	On	Off	On	Off	Off	Off
Emergency Heat	Stage 2	On	Off	On	On	Off	Off
Heat	Defrost	On	Both Compressors	On	Off	On[b]	On[b]
Cool	Don’t Care	Off	Off	Off	Off	On	On

[a] Only units configured as an independent circuit heat pump will control the switchover valve 2 output.

[b] On units with independent circuits, only the circuit whose conditions are correct for defrost will enter defrost mode and energize the switchover valve. The other circuit's switchover valve will remain in its previous state until it has a defrost request or until the unit mode changes.

Table 10. Heat pump control (2-step mechanical heating)

Active Unit Mode	Stage	Indoor Fan	Compressor	Auxiliary Heat 1	Auxiliary Heat 2	Switchover Valve 1	Switchover Valve 2[a]
Heat/Off	Off	Off	Off	Off	Off	Off	Off
Heat	Stage 1	On	Compressor 1	Off	Off	Off	Off
Heat	Stage 2	On	Both Compressors	Off	Off	Off	Off
Heat	Auxiliary 1	On	Both Compressors	On	Off	Off	Off
Heat	Auxiliary 2	On	Both Compressors	On	On	Off	Off

Table 10. Heat pump control (2-step mechanical heating) (continued)

Active Unit Mode	Stage	Indoor Fan	Compressor	Auxiliary Heat 1	Auxiliary Heat 2	Switchover Valve 1	Switchover Valve 2[a]
Emergency Heat	Stage 1	On	Off	On	Off	Off	Off
Emergency Heat	Stage 2	On	Off	On	On	Off	Off
Heat	Defrost	On	Both Compressors	On	Off	On[b]	On[b]
Cool	Don't Care	Off	Off	Off	Off	On	On

[a] Only units configured as an independent circuit heat pump will control the switchover valve 2 output.
[b] On units with independent circuits, only the circuit whose conditions are correct for defrost will enter defrost mode and energize the switchover valve. The other circuit's switchover valve will remain in its previous state until it has a defrost request or until the unit mode changes.

Service Test Modes for ReliaTel™ Controls

Test Modes

Upon power initialization, the RTRM performs self-diagnostic checks to ensure that all internal controls are functional. It also checks the configuration parameters against the components connected to the system. The system LED located on the RTRM module is turned **"On"** within one second of power-up if internal operation is okay.

Use one of the following **"Test"** procedures to bypass some time delays and to start the unit at the control panel. Each step of unit operation can be activated individually by temporarily shorting across the **"Test"** terminals for 2 to 3 seconds. The system LED located on the RTRM module will blink when the test mode has been initiated. The unit can be left in any **"Test"** step for up to one hour before it will automatically terminate, or it can be terminated by opening the main power disconnect switch. Once the test mode has been terminated, the system LED will glow continuously and the unit will revert to the **"System"** control.

There are three methods in which the **"Service Test"** can be cycled at LTB-Test 1(T1) and LTB-Test 2 (T2).

Step Test Mode

This method initiates the different components of the unit, one at a time, by temporarily shorting across the two test terminals for 2 to 3 seconds.

For the initial start-up of the unit, this method allows the technician to cycle a component **"On"** and have up to one hour to complete the check. Service Test Mode will be ignored if a short is present across Test 1 and Test 2 at start-up.

Resistance Test Mode

This method can be used for start-up when a decade box for variable resistance outputs is available. This method initiates the different components of the unit, one at a time, when a specific resistance value is placed across the two test terminals. The unit will remain in the specific test mode for approximately one hour even though the resistance is left on the test terminals.

Table 11. Test mode states for SZVAV independent circuit heat pump units with auxiliary electric heat

TEST STEP	MODE	FAN	VFD COMMAND	COMP 1	COMP 2	HEAT 1	HEAT 2	SOV1	SOV2	OHMS
1	FAN ON	ON	58% (0 - 2.8 VDC)	OFF	OFF	OFF	OFF	OFF	OFF	2.2K
2	COOL 1	ON	86% (3.8 - 7.7 VDC)	ON	OFF	OFF	OFF	ON	ON	4.7K
3	COOL 2	ON	100% (5.6 - 10 VDC)	ON	ON	OFF	OFF	ON	ON	6.8K
4	HEAT 1	ON	100% (5.6 - 10 VDC)	ON	OFF	OFF	OFF	OFF	OFF	10K
5	HEAT 2	ON	100% (5.6 - 10 VDC)	ON	ON	OFF	OFF	OFF	OFF	15K
6	Heat 3	ON	100% (5.6 - 10 VDC)	ON	ON	ON	OFF	OFF	OFF	22K
7	Heat 4	ON	100% (5.6 - 10 VDC)	ON	ON	ON	ON	OFF	OFF	27K
8	Defrost	ON	100% (5.6 - 10 VDC)	ON	ON	ON	OFF	ON	ON	33K
9	Emergency Heat	ON	100% (5.6 - 10 VDC)	OFF	OFF	ON	ON	OFF	OFF	47K

Auto Test Mode

This method is not recommended for start-up due to the short timing between individual component steps. This method initiates the different components of the unit, one at a time, when a fixed jumper is installed across the test terminals.

The unit will start the first test step and change to the next step every 30 seconds. At the end of the test mode, control of the unit will automatically revert to the applied **"System"** control method. For unit test steps, test modes, and step resistance values to cycle the various components, refer to Table 11, p. 33.

Troubleshooting

Troubleshooting ReliaTel™ Controls

⚠ WARNING

Live Electrical Components!

Failure to follow all electrical safety precautions when exposed to live electrical components could result in death or serious injury.
When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

The RTRM has the ability to provide the service personnel with some unit diagnostics and system status information.

Before turning the main power disconnect switch **"Off,"** follow the steps below to check the ReliaTel™ Refrigeration Module (RTRM). All diagnostics & system status information stored in the RTRM will be lost when the main power is turned **"Off"**.

To prevent injury or death from electrocution, it is the responsibility of the technician to recognize this hazard and use extreme care when performing service procedures with the electrical power energized.

Note: *The J6 & J7 screw terminals must be tightened in order to accurately measure voltage in the required steps.*

1. Verify that the system LED on the RTRM is burning continuously. If the LED is lit, go to Step 3.
2. If the LED is not lit, verify that 24 VAC is present between J1-1 and J1-2. If 24 VAC is present, proceed to Step 3. If 24 VAC is not present, check the unit main power supply, check transformer (TNS1). Proceed to Step 3 if necessary.
3. Utilizing "Method 1", p. 34 or "Method 2", p. 35 in the System Status Checkout Procedure section, check the following:
   - System status
   - Heating status
   - Cooling status

   Note: *If a System failure is indicated, proceed to Step 4. If no failures are indicated, proceed to Step 5.*
4. If a System failure is indicated, recheck Step 1 and Step 2. If the LED is not lit in Step 1, and 24 VAC is present in Step 2, then the RTRM has failed. Replace the RTRM.
5. If no failures are indicated, use one of the TEST mode procedures described in the "Service Test Modes chapter," p. 33 to start the unit. This procedure will allow you to check all of the RTRM outputs, and all of the external controls (relays, contactors, etc.) that the RTRM outputs energize, for each respective mode. Proceed to Step 6.
6. Step the system through all of the available modes, and verify operation of all outputs, controls, and modes. If a problem in operation is noted in any mode, you may leave the system in that mode for up to one hour while troubleshooting. Refer to the sequence of operations for each mode, to assist in verifying proper operation. Make the necessary repairs and proceed to Step 7 and Step 8.
7. If no abnormal operating conditions appear in the test mode, exit the test mode by turning the power **"Off"** at the main power disconnect switch.
8. Refer to the individual component test procedures if other microelectronic components are suspect.

System Status Checkout Procedure

"System Status" is checked by using one of the following two methods:

Method 1

If the Zone Sensor Module (ZSM) is equipped with a remote panel with LED status indication, you can check the unit within the space. If the ZSM does not have LED's, use "Method 2", p. 35. BAYSENS010B, BAYSENS011B, BAYSENS119A, BAYSENS020A, BAYSENS021A, BAYSENS023A, BAYSENS109 and BAYSENS110 all have the remote panel indication feature. The LED descriptions are listed below.

- **LED 1 (System)**
  - **"On"** during normal operation.
  - **"Off"** if a system failure occurs or the LED fails.
  - **"Flashing"** indicates test mode
- **LED 2 (Heat)**
  - **"On"** when the heat cycle is operating.
  - **"Off"** when the heat cycle terminates or the LED fails.
  - **"Flashing"** indicates a heating failure.
- **LED 3 (Cool)**
  - **"On"** when the cooling cycle is operating.
  - **"Off"** when the cooling cycle terminates or the LED fails.
  - **"Flashing"** indicates a cooling failure.

The following information describes the complete listing of failure indication causes.

System Failure

Check the voltage between terminals 6 and 9 on J6, it should read approximately 32 VDC. If no voltage is present, a System failure has occurred. Refer to Step 4 in the previous section for the recommended troubleshooting procedure.

Cooling Failure

1. Cooling and heating set point (slide pot) on the zone sensor has failed. Refer to the "Programmable & Digital Zone Sensor Test", p. 37.
2. Zone temperature thermistor ZTEMP on ZTS failed. Refer to the "Programmable & Digital Zone Sensor Test", p. 37.
3. CC1 or CC2 24 VAC control circuit has opened, check CC1 & CC2 coils, and any of the controls below that apply to the unit (HPC1, HPC2, DTL1, DTL2).
4. LPC1 has opened during the 3 minute minimum "on time" during 4 consecutive compressor starts, check LPC1 or LPC2 by testing voltage between the J1-8 & J3-2 terminals on the RTRM and ground. If 24 VAC is present, the LPCs have not tripped. If no voltage is present, LPCs have tripped.

Simultaneous Heat and Cool Failure

⚠ WARNING

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- Emergency Stop is activated.

Method 2

The second method for determining system status is done by checking voltage readings at the RTRM (J6). The system indication descriptions and the approximate voltages are listed below.

System Failure

Measure the voltage between terminals J6-9 & J6-6.

- **Normal Operation** = approximately 32 VDC
- **System Failure** = less than 1 VDC, approximately 0.75 VDC
- **Test Mode** = voltage alternates between 32 VDC & 0.75 VDC

Heat Failure

Measure the voltage between terminals J6-7 & J6-6.

- **Heat Operating** = approximately 32 VDC
- **Heat Off** = less than 1 VDC, approximately 0.75 VDC
- **Heating Failure** = voltage alternates between 32 VDC & 0.75 VDC

Cool Failure

Measure the voltage between terminals J6-8 & J6-6.

- **Cool Operating** = approximately 32 VDC
- **Cool Off** = less than 1 VDC, approximately 0.75 VDC
- **Cooling Failure** = voltage alternates between 32 VDC & 0.75 VDC

To use LED's for quick status information at the unit, purchase a BAYSENS010B ZSM and connect wires with alligator clamps to terminals 6 through 10. Connected each respective terminal wire (6 through 10) from the Zone Sensor to the unit J6 terminals 6 through 10.

Note: *If the system is equipped with a programmable zone sensor, (BAYSENS119A, or BAYSENS023A), the LED indicators will not function while the BAYSENS010A is connected.*

Resetting Cooling and Heating Lockouts

Cooling Failures and Heating Lockouts are reset in an identical manner. "Method 1", p. 35 explains resetting the system from the space; "Method 2", p. 35 explains resetting the system at the unit.

Note: *Before resetting Cooling Failures and Heating Lockouts check the Failure Status Diagnostics by the methods previously explained. Diagnostics will be lost when the power to the unit is disconnected.*

Method 1

To reset the system from the space, turn the **MODE** selection switch at the zone sensor to the **OFF** position. After approximately 30 seconds, turn the **MODE** selection switch to the desired mode, i.e. **HEAT**, **COOL**, or **AUTO**.

Method 2

To reset the system at the unit, cycle the unit power by turning the disconnect switch **OFF** and then **ON**

Lockouts can be cleared through the building management system. Refer to the building management system instructions for more information.

Zone Temperature Sensor (ZTS) Service Indicator

The ZSM SERVICE LED is a generic indicator that will signal the closing of a Normally Open switch at any time, providing the Indoor Motor (IDM) is operating.

This indicator is usually used to indicate an airside fan failure.

The RTRM will ignore the closing of this Normally Open switch for 2 (±1) minutes. This helps prevent nuisance SERVICE LED indications.

Temperature Tests

Note: *These procedures are not for programmable or digital models and are conducted with the Zone Sensor Module electrically removed from the system.*

Test 1 - Zone Temperature Thermistor (ZTEMP)

This component can be tested by measuring the resistance between terminals 1 and 2 on the Zone Temperature Sensor. See Table 12, p. 36 for typical indoor temperatures, and corresponding resistive values.

Table 12. Typical indoor temperatures and values

Zone Temperature	Nominal Resistance
50°F or 10.0°C	19.9 Kohms
55°F or 12.8°C	17.47 Kohms
60°F or 15.6°C	15.3 Kohms

Table 12. Typical indoor temperatures and values (continued)

Zone Temperature	Nominal Resistance
65°F or 18.3°C	13.49 Kohms
70°F or 21.1°C	11.9 Kohms
75°F or 23.9°C	10.50 Kohms
80°F or 26.7°C	9.3 Kohms
85°F or 29.4°C	8.25 Kohms
90°F or 32.2°C	7.3 Kohms

Test 2 - Cooling Set Point (CSP) and Heating Set Point (HSP)

Cool SP = Terminals 2 and 3

Range = 100 to 900 Ohms approximate

Heat SP = Terminals 2 and 5

Range = 100 to 900 Ohms approximate

Test 3 - System Mode and Fan Selection

The combined resistance of the **MODE** selection switch and the **FAN** selection switch can be measured between terminals 2 and 4 on the Zone Sensor. The possible switch combinations are listed in Table 13, p. 36 with their corresponding resistance values.

Table 13. Test 3 - system mode and fan selection

Resistance Valves(Ohms)	Zone Sensor Unit/Fan Mode	Local Unit Mode	Local Fan Mode
2.32K	Off/Auto	Off	Auto
4.87K	Cool/Auto	Cool	Auto
7.68K	Auto/Auto	Auto	Auto
10.77K	Off/On	Off	On
13.32K	Cool/On	Cool	On
16.13K	Auto/On	Auto	On
19.48K	Heat/Auto	Heat	Auto
27.93K	Heat/On	Heat	On
35.0K	Emergency Heat/Auto	Emergency Heat	Auto
43.45K	Emergency Heat/On	Emergency Heat	On
Out of Range (Short)	INVALID/Short	Invalid (CV), Auto (VAV)	Invalid
Out of Range (Open)	INVALID/Open	Invalid (CV), Off (VAV)	Invalid

Test 4 - LED Indicator Test (SYS ON, HEAT, & COOL)

⚠ WARNING

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When it is necessary to work with live electrical components, have a qualified licensed electrician or other individual who has been properly trained in handling live electrical components perform these tasks.

Method 1

Testing the LED using a meter with diode test function. Test both forward and reverse bias. Forward bias should measure a voltage drop of 1.5 to 2.5 volts, depending on your meter. Reverse bias will show an Over Load, or open circuit indication if LED is functional.

Method 2

Testing the LED with an analog Ohmmeter. Connect Ohmmeter across LED in one direction, then reverse the leads for the opposite direction. The LED should have at least 100 times more resistance in reverse direction, as compared with the forward direction. If high resistance in both directions, LED is open. If low in both directions, LED is shorted.

Method 3

To test LED's with ZSM connected to unit, test voltages at LED terminals on ZSM. A measurement of 32 VDC, across an unlit LED, means the LED has failed.

Important: *Measurements should be made from LED common (ZSM terminal 6 to respective LED terminal).*

Programmable & Digital Zone Sensor Test

Testing Serial Communication Voltage

1. Verify 24 VAC is present between terminals J6-14 & J6-11.

⚠ WARNING

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2. Disconnect wires from J6-11 and J6-12. Measure the voltage between J6-11 and J6-12, should be about 32 VDC.
3. Reconnect wires to terminals J6-11 and J6-12. Measure voltage again between J6-11 and J6-12, voltage should flash high and low every 0.5 seconds. The voltage on the low end will measure about 19 VDC, while the voltage on the high end will measure from approximately 24 to 38 VDC.
4. Verify all modes of operation, by running the unit through all of the steps in "Service Test Modes for ReliaTel Controls," p. 33.
5. After verifying proper unit operation, exit the test mode. Turn the fan on continuously at the ZSM, by pressing the button with the fan symbol. If the fan comes on and runs continuously, the ZSM is good. If you are not able to turn the fan on, the ZSM is defective.

RLCI Loss of Communications

If the RLCI loses input from the building management system, the RTRM will control in the default mode after approximately 15 minutes. If the RTRM loses the Heating and Cooling setpoint input, the RTRM will control in the default mode instantaneously. The temperature sensing thermistor in the Zone Sensor Module is the only component required for the **"Default Mode"** to operate.

Maintenance

⚠ WARNING

Hazardous Voltage w/Capacitors!

Failure to disconnect power and discharge capacitors before servicing could result in death or serious injury.

Disconnect all electric power, including remote disconnects and discharge all motor start/run capacitors before servicing. Follow proper lockout/tagout procedures to ensure the power cannot be inadvertently energized. For variable frequency drives or other energy storing components provided by Trane or others, refer to the appropriate manufacturer's literature for allowable waiting periods for discharge of capacitors. Verify with an appropriate voltmeter that all capacitors have discharged.

For additional information regarding the safe discharge of capacitors, see PROD-SVB06A-EN.

NOTICE

Operating Under Vacuum!

Do not operate or apply power to the compressor while under a vacuum. Failure to follow these instructions will result in compressor failure.

Perform all of the indicated maintenance procedures at the intervals scheduled. This will prolong the life of the unit and reduce the possibility of costly equipment failure.

Monthly

Conduct the following maintenance inspections once per month.

- ☐ Check unit wiring to ensure all connections are tight and that the wiring insulation is intact.
- ☐ Inspect the condenser coils for dirt and debris. If the coils appear dirty, clean them.
- ☐ With the unit operating in the cooling mode, check the suction and discharge pressures and compare them with Pressure Curve values in unit Service Facts. Record these readings on the "Maintenance Log", p. 39.

Annually (Cooling Season)

The following maintenance procedures must be performed at the beginning of each cooling season to ensure efficient unit operation.

- ☐ Perform all of the monthly maintenance inspections.
- ☐ With the unit operating, check unit superheat and record the reading in the "Maintenance Log", p. 39.
- ☐ Remove any accumulation of dust and/or dirt from the unit casing.
- ☐ Remove corrosion from any surface and repaint. Check the gasket around the control panel door to ensure it fits correctly and is in good condition to prevent water leakage.
- ☐ Inspect the control panel wiring to ensure that all connections are tight and that the insulation is intact.

  Note: *Condenser fan motors are permanently lubricated.*
- ☐ Check refrigerant piping and fittings for leaks
- ☐ Inspect the condenser coils for dirt and debris. If the coils appear dirty, clean them.

Coil Cleaning

Regular coil maintenance, including annual cleaning-enhances the unit's operating efficiency by minimizing:

- compressor head pressure and amperage draw
- water carryover
- fan brake horsepower
- static pressure losses

At least once each year — or more often if the unit is located in a "dirty" environment — clean the coil using the instructions outlined below. Be sure to follow these instructions as closely as possible to avoid damaging the coils. To clean refrigerant coils, use a soft brush and a sprayer. Contact your local Parts Center for appropriate detergents.

1. Remove enough panels from the unit to gain safe access to coil.
2. Straighten any bent coil fins with a fin comb.
3. Remove loose dirt and debris from both sides of the coil with a soft brush.
4. Mix the detergent with water according to the manufacturer's instructions. If desired, heat the solution to 150° F maximum to improve its cleansing capability.
5. Pour the cleaning solution into the sprayer.
6. Spray the leaving-airflow side of the coil first; then spray the opposite side of the coil. Allow the cleaning solution to stand on the coil for five minutes.
7. Rinse both sides of the coil with cool, clean water.
8. Inspect both sides of the coil; if it still appears to be dirty, repeat Step 7 and 8.
9. Reinstall all of the components and panels removed in Step 1; then restore power to the unit.
10. Using a fin comb, straighten any coil fins that were inadvertently bent during the cleaning process.

Maintenance Log

Date	Ambient Temp. (°F)	Evaporator Entering Air		Compressor				Superheat (°F) (at compressor)		Subcooling (°F) (at service valve)	
		Dry Bulb	Wet Bulb	Suction Pressure		Discharge Pressure		Circuit #1	Circuit #2	Circuit #1	Circuit #2
				(C1)	(C2)	(C1)	(C2)				

Note: *Perform each inspection once per month (during cooling season) while unit is operating*

Wiring Diagram Matrix

Table 14. Wiring schematics R-22 heat pump

R–22 Unit	Power Diagram	Connection Diagram
TWA090A30RGA	231304570100	231304610100
TWA090A40RGA	231304570100	231304610100
TWA120A30RGA	231304580100	231304620100
TWA120A40RGA	231304570100	231304610100
TWA180B30RGA	231304060100	231304290100
TWA180B40RGA	231304060100	231304290100
TWA240B30RGA	231304050100	231304300100
TWA240B40RGA	231304060100	231304290100

Note: Wiring diagrams are available through e-Library or by contacting your local sales office.

The manufacturer optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, the manufacturer offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts. For more information, visit www.IRCO.com.

The manufacturer has a policy of continuous product and product data improvements and reserves the right to change design and specifications without notice.

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